MACHINERY

Design—Construction—Operation

Volume 41 **DECEMBER, 1934** **Number 4**

Much new knowledge has been accumulated in recent years on the subject of bearings and bearing design. Little has been published, however, in a form that clearly explains the latest procedure in designing efficient heavy-duty plain bearings. The leading article in January MACHINERY on *Modern Bearing Design* will prove of unusual interest and value as a comprehensive and clearly presented review of fundamental principles.

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THE HANDS

L & S LATHES

MACHINERY

Volume 41 NEW YORK, DECEMBER, 1934 Number 4

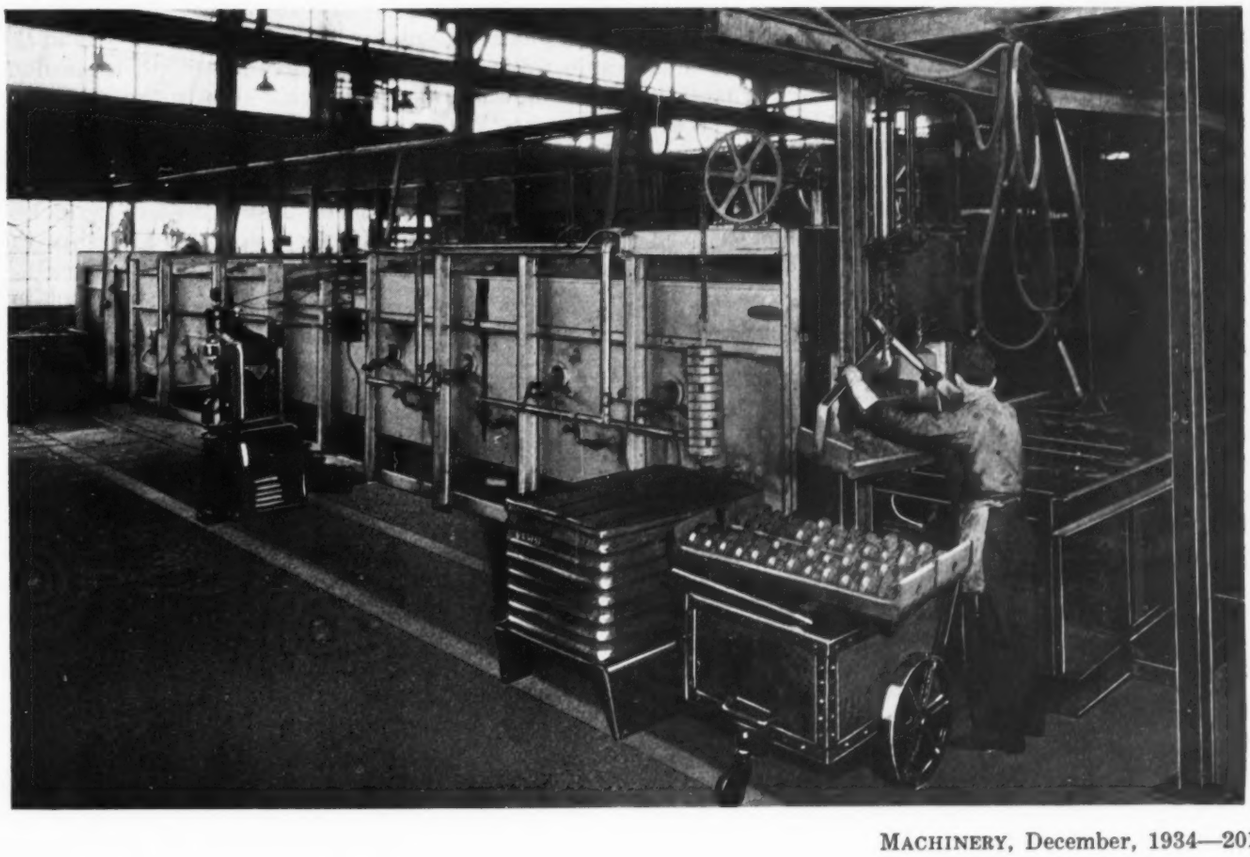
Heat-Treating in an Automobile Plant

Thirty-Two Gas-Fired Furnaces in the Heat-Treating Department at the Dodge Plant of the Chrysler Corporation Handle Huge Quantities of Work

By J. B. NEALEY

AMONG the diversified work carried on in an automobile plant, heat-treating assumes an important place. Great quantities of parts are annealed, normalized, hardened, and otherwise heat-treated, including gear blanks, crankshafts, rear-axle shafts, and gear-shift levers. At the Dodge plant of the Chrysler Corporation, Detroit, Mich., thirty-two huge gas-fired furnaces are installed in a building 400 feet long by 50 feet wide to take care of this work. Heat-treating in an automobile plant is a big job.

One of the most interesting features of the equipment in the heat-treating department at this



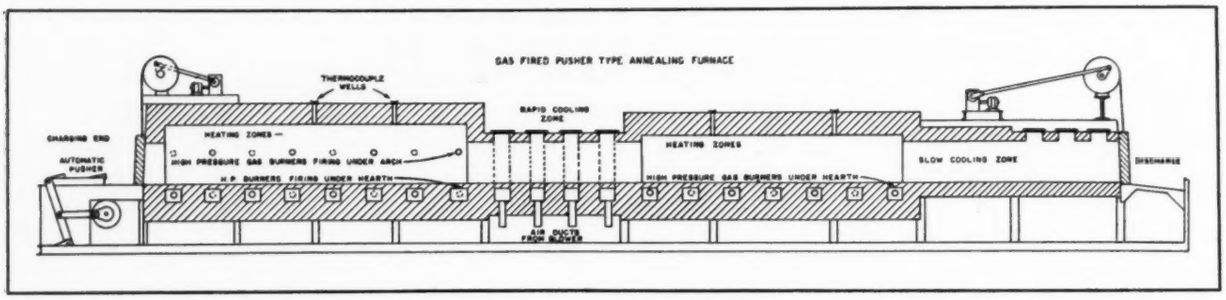


Fig. 1. Gas-fired Annealing Furnace of the Continuous Pusher Type, which has a Heating Chamber, Two Holding Chambers, and Three Cooling Zones

plant is a continuous pusher type of annealing furnace which is so closely controlled that there is no perceptible variation in the grain structure of the work. Machining costs have been reduced materially because of the uniformity with which parts are heat-treated by this equipment.

This furnace, which is shown in the heading illustration, is 53½ feet long, 7 feet wide and 8 feet high. The brick and refractory construction is completely encased in ¼-inch steel plate. A four-foot charging platform, a drive base for the pusher mechanism, and a four-foot unloading platform are built of structural steel integral with the furnace shell. Three alloy steel rails are positioned on the hearth of the furnace, as indicated in Fig. 2. These rails are of channel section and are provided with rollers in the center. They are cast in short sections to avoid warpage and are held in place by cross-bars.

The work to be annealed is loaded on alloy steel trays which are pushed through the furnace by means of the rollers on the channel rails. When discharged at the far end of the furnace, the trays are returned to the charging end by a pneumatic hoist equipped with "ice tongs," as shown in the heading illustration. The hoist runs on an overhead rail extending parallel with the front of the furnace.

The furnace is divided into five chambers or zones which are provided with separate temperature controls. The arrangement is as indicated in Fig. 1. There is a heating and holding chamber 4 feet 6 inches wide by 13 feet 10½ inches long by 21 inches high; a cooling chamber 4 feet wide by 8 feet 7½ inches long by 17 inches high; a second holding chamber 4 feet 6 inches wide by 12 feet long by 15 inches high; a second cooling chamber 4 feet wide by 5 feet long by 17 inches high; and a third cooling chamber 4 feet wide by 5 feet long by 17 inches high.

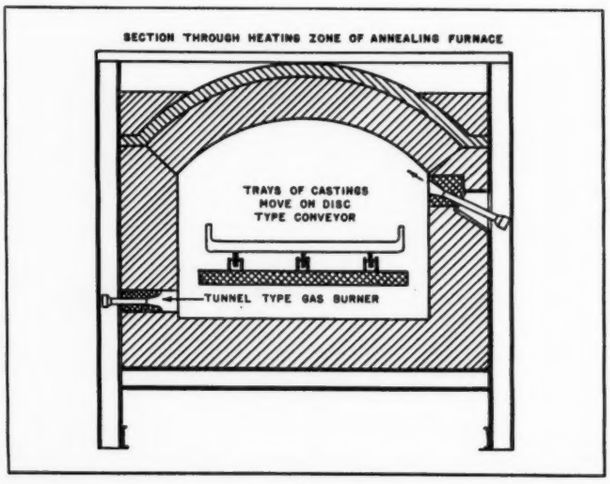


Fig. 2. Sectional View of the Continuous Annealing Furnace Shown in Fig. 1

In the first heating and holding chamber, there are sixteen gas burners, eight on each side. One-half of these under-fire the hearth, while the others fire tangentially to the arch. The burners are controlled in two zones by two motor-operated valves and two potentiometer type controllers equipped with recorders. Air under pressure is supplied by a blower for combustion.

The first cooling zone is designed to reduce the temperature of the work 325 degrees F. It is provided with cooling flues, built into the floor and the side walls. Cold air is forced through these flues by a blower to speed up this step in the annealing process. With this construction, the atmosphere inside the furnace is undisturbed. The openings between the arches of the cooling zone are covered and sealed by means of cast plates of a nickel-chromium alloy, their purpose being to insure the transfer of heat by radiation.

The second holding zone or chamber has four gas burners on each side that under-fire the hearth. These burners are also controlled in two zones. The second cooling zone has dampered vents built into the side walls. The third cooling zone has similar vents, and in addition, a perforated arch. The openings of this arch are covered, like those of the first cooling zone.

Gear blanks forged

from S A E 6150 steel are heated to 1650 degrees F. in the heating chamber and kept at this temperature in the first holding zone, the pusher being so timed that about two and three-quarters hours is required for the parts to pass through these two zones. The gear blanks then pass into the first cooling zone, where their temperature is reduced to 1325 degrees F. in about one and three-quarters hours. This temperature is maintained during the two and a half hours that it takes for the gears to travel through the second holding zone. A reduction in temperature to 1250 degrees F. is accomplished during the next hour as the gears pass through the second cooling zone, and another drop to 700 degrees F. takes place in the following hour, during which the gears pass through the third cooling chamber. The gears are discharged at this temperature after having been in the furnace for nine hours.

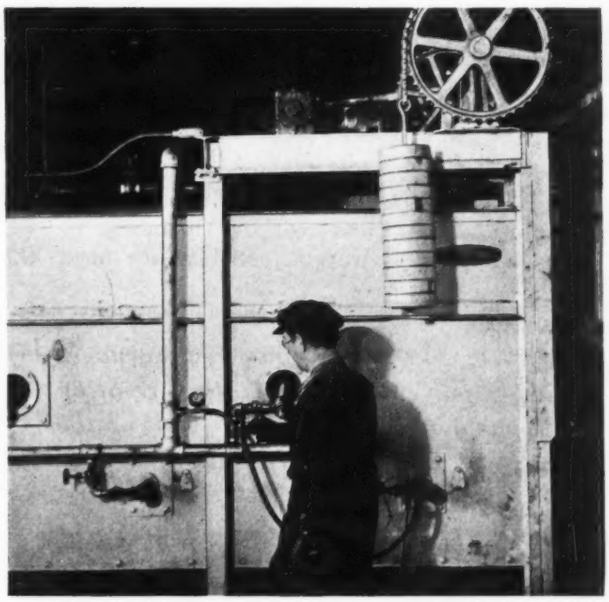


Fig. 3. Adjusting One of the Gas Burners on the Continuous Pusher Type Annealing Furnace

When the gear teeth have been cut and the gears finish-machined, they are hardened by quenching at a temperature of 1475 degrees F., and then drawn at 300 degrees F. At the end of this heat-treatment, the gears have a scleroscope hardness of from 72 to 78. Readings are made by means of the floor-type hardness testing machine illustrated in Fig. 4.

A long row of furnaces extends almost the entire length of the building in the center, as shown in Fig. 6. These furnaces have an average hearth size of 6 by 10 feet. They are constructed entirely of brick, heavily insulated, and are steel encased. Each one is equipped with a motor-operated door, at both the front and rear.

The work to be heat-treated in these furnaces reaches the department in steel boxes 2 feet wide by 4 feet long by 2 feet deep, which are carried on skids by electric lift trucks. On the side of the building opposite the front of the furnaces are steel platforms which are kept supplied with steel trays of the same dimensions as the furnace hearths and having sides 6 inches high. The work to be heat-treated is spread out on these trays. The loaded trays are then fed into the furnace by a charger similar to those used in connection with open-hearth steel furnaces. This charger, which is illustrated in Fig. 5, operates in the aisle between the furnaces and the loading platforms on a track 15 feet wide. The charger has an arm that is movable in all directions, the entire equipment being operated by motors.

Fig. 4. Checking the Hardness of a Part that has been Hardened and Tempered

Each tray of work is picked up by the charger arm from the loading platform, swung in a horizontal plane through a half circle, and then thrust into a furnace. The steel-plate bottom of the tray is slowly withdrawn to allow the work to drop on the furnace hearth, after which the tray and its bottom are replaced on one of the platforms for reloading. The furnaces employed for hardening are provided at the rear end with quenching tanks that are equipped with steel baskets. When the work has been properly heated, it is pushed by the charger directly into these tank baskets. Skids and boxes are placed in back of the normalizing

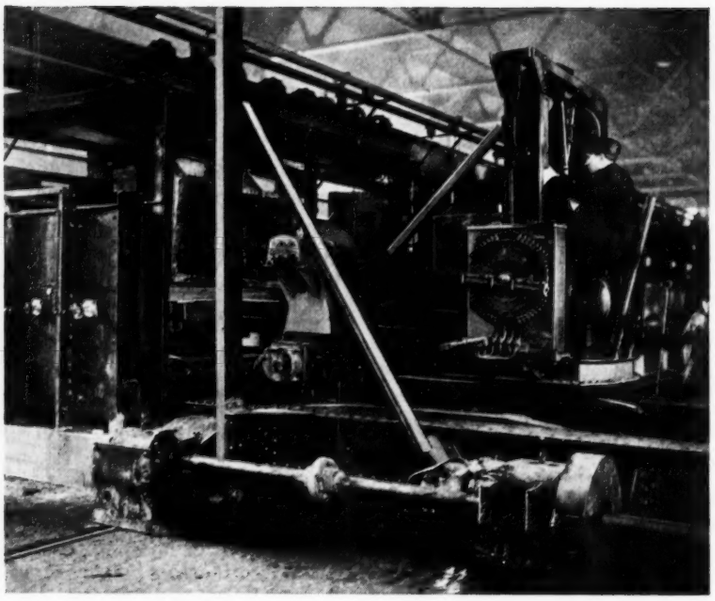


Fig. 5. Charging a Tray Loaded with Work into a Continuous Conveyor Type of Gas-fired Furnace

furnaces to receive the work.

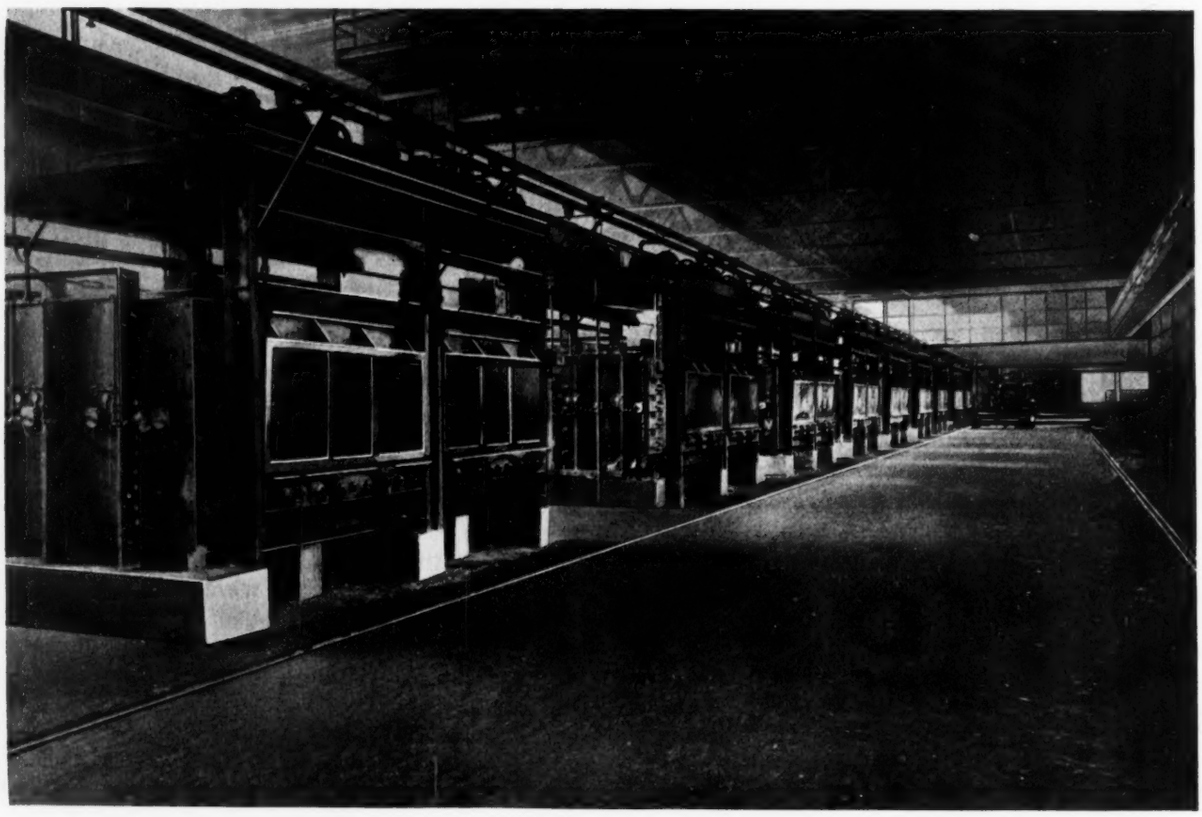
These furnaces, as may be seen in Fig. 6, are paired, each set of two being placed close together so as to save radiation losses. Each furnace is heated by four gas burners of the high-pressure velocity type. They fire tangentially to the arch. They are also equipped with automatic temperature controls of the potentiometer type which energize the motors by means of which the valves in the gas supply lines are operated.

Six continuous furnaces of the pusher type, approximately 25 feet long, 10 feet wide, and 6 feet high, are located along the end wall of the building, seen in the background of Fig. 6. The hearths of these furnaces are provided with three I-beams. The work is piled on shoes or trays which are slid through the furnace on the beams. As the work is discharged on a platform, the operator places the parts in boxes that rest on skids and lays the shoes or trays on a roller conveyor that returns them to the charging end of the furnace for reloading.

Gas at a pressure of 15 pounds per square inch is employed in all of the furnaces, a compressor being used to provide this pressure. The gas is distributed throughout the building by a 6-inch pipe that runs over the furnaces.

Oil, caustic, and water quenches are used, the

Fig. 6. Thirty-two Gas-fired Furnaces are Used in the Main Heat-treating Department at the Dodge Plant of the Chrysler Corporation



quenching tanks holding about 600 gallons apiece. Because mass quenching is employed, continuous cooling of the quenches is necessary. For this purpose, the oil tanks are all connected with an underground cooling tank of 10,000 gallons capacity. Another tank of the same size is provided for cooling the caustic quenches. These cooling tanks are equipped with cold water coils that are connected to a tower 75 feet high. The water is continually circulated by pumps. The oil and caustic solutions are also circulated continuously by pumps. With this system, the quenches can be kept cold enough for effective work.

All furnaces are controlled from a central room that contains recording pyrometers not only for the furnaces of the heat-treating department, but also for many other furnaces located throughout the plant. All together there are seventy-eight recorders mounted in rows of panels. By this means, the metallurgist can instantly check any furnace, and he is supplied with complete time and temperature records for future reference.

Improved Machinery the Road to Business Activity

In discussing the paper "Machinery and Equipment Policies in View of the Present Business Situation," read before the Society of Automotive Engineers and published on page 161 of November MACHINERY, *Herman H. Lind, General Manager of the National Machine Tool Builders' Association, brought out a number of important points, as given in the following abstract.*

During the early process of code making, many industries went to Washington with an over-production complex, and in their perplexed state of mind asked for, and in some cases secured, restrictive provisions relating to the installation of new machinery. These provisions were unsound and uneconomical, and retarded progress. A few of these restrictions were allowed to remain in the codes until the cost raising effect of higher wages and shorter hours was fully understood.

It became the duty of many industries, of which the machine tool building industry was one, to resist the adoption of these restrictions in the codes, and it was not long before the clearer thinkers in the National Recovery Administration saw very plainly where such restrictions would lead. As a result, few codes now include restrictions on the installation of modern equipment.

To understand fully the effect of improved equipment, let us look at two very large industries that have followed diametrically opposite policies in respect to modernization—namely, the building industry and the automobile industry. The building industry is doing much of its work today with the same tools, processes, and materials—somewhat refined to be sure—as were used centuries ago. Restrictions have been placed on the output per day per man and on the use of efficient machines and tools in the building industry. As a result, the costs in this industry are so high as to be a check on home construction, and in spite of the public money that has been appropriated for building and construction work, the industry is now operating at 76 per cent below the average for 1924 to 1929.

On the other hand, the automobile industry has been eager to adopt every cost-saving device and to produce, by modern methods, a more satisfactory and longer wearing product. The result is the low-priced cars of today that are more comfortable and dependable and have greater speed than the high-priced cars of only a few years ago—and this with a much lower cost of operation.

As a result, automobiles are sold today in greater numbers because the buyer gets much more proportionately for his money in a car than in a house. Other industries that have prospered through the use of modern equipment are those making refrigerators, washing machines, vacuum sweepers, and many similar products.

Another point that every manufacturer should consider is his method of setting up a depreciation reserve. This reserve should not be merely another bookkeeping item. The reserve should be available in cash or its equivalent as a definite means for replacing obsolete machinery. Too many companies are suffering today because their machinery is obsolete and they have no money to buy new equipment. The depreciation has been entered on the books, but the actual depreciation reserve has been somewhat dissipated.

The conditions and restrictions referred to, however, are only temporary checks. They may hinder progress for a while, but American manufacturers have been able to overcome artificial obstacles in the past; and it is reasonable to believe that industry will shortly be going forward with all the progressiveness, initiative, and confidence that it once possessed.

* * *

"Economic nationalism is built on the hypothesis that there is something very clever about shipping large quantities of goods out of your country and taking no goods in return for them—in other words, without getting paid for them."—*James D. Mooney, president of the General Motors Export Corporation, and president of the American Manufacturers' Association*

Can Trade Secrets be Legally Protected?

Secret Processes, Trade Secrets, and Confidential Files of Customers' Names Enjoy Definite Protection, as Established by the Courts

By A. H. RODRICK

MANY manufacturers and business men do not realize the extent to which they can prevent the disclosure of their business secrets by present or former employes, as well as the use of them by competitors after unlawful disclosure. The purpose of this article is to explain briefly the protection available for these secrets, which are called in the law "trade secrets."

A trade secret has been legally defined as "a plan or process, tool, mechanism, or compound, known only to its owner and those of his employes to whom it is necessary to confide it in order to apply it to the use intended."

It differs from a patent in that when an article manufactured by some secret process which is not patented is placed upon the market, anyone may discover, if he can, either by an examination of the product or by any other honest method or fair means, what that process is, and should discovery be thus made, the discoverer can legally sell the process or use it in the manufacture of similar articles. In such case, the manufacturer's or inventor's property in his process is gone. However, if the knowledge is gained by a breach of contract or confidence, the rule is otherwise.

The fact that an invention is patentable does not require that the inventor take out a patent, and failure to do so will not deny him the right to an injunction against those who reveal its existence and details in violation of trust and confidence or those who obtain the knowledge as a result of such violation with intent to make use of it. As said by the Supreme Court of New York: "Neither process of manufacture, nor machinery, nor machinery installation need be patentable to be protected as trade secrets." (173 N. Y. Supp. 334.)

To What Extent Do Trade Secrets Enjoy Legal Protection?

A trade secret is, therefore, a property right which may be assigned, and which the courts will protect by injunction against unwarranted disclosure and unauthorized use by others than the rightful owner. It matters not whether the process constituting the secret is or is not a patentable invention. The owner, however, is entitled only to protection from a breach of contract or confidence against one to whom he has confided the secret and those to whom the confidant may divulge it. He is not entitled to the aid of the court in preserving his secret from becoming known to the general public.

For example, a manufacturer is not entitled to an injunction to restrain the use of machines modeled after his own by another manufacturer, who obtained his information from former employes of the complainant, who were not informed and had no knowledge that the design involved was a trade secret. On the other hand, one who disguises himself as a laborer and obtains employment with the party owning the trade secret for the purpose of applying it for his own benefit will be enjoined from using it, because he obtained his knowledge through fraud or bad faith.

It is well settled that the employes of one having a trade secret, who are under an express contract, or a contract implied from their confidential relation to the employer, not to disclose the secret, will be enjoined from divulging or using it to his injury, whether before or after leaving his employment. It is also well settled that those who obtain their knowledge of the secret from such an employe will likewise be enjoined from using it.

What Has to be Proved in a Case Involving Violation of a Trade Secret?

In a suit to prevent the unlawful use of a trade secret, the claim that the plan, process, tool, mechanism, or compound is a secret must be clearly established, since what is commonly known to the trade is not a trade secret; nor will an injunction be granted against the unauthorized use of a trade secret unless it appears that the plaintiff developed or invented the secret or that he is possessed of the sole right to use it. A mere mechanical advance in the use of a process is not a "new process" or discovery that will be protected by an injunction, but to constitute a "new process" there must be employed creative faculties in originating it, amounting to a meritorious discovery or invention.

Protection of the Files of Names of Customers

The right to protect a trade secret is not confined to secret processes of manufacture. The principle has been extended by the courts to include the names of customers whose trade has been secured by effort and the expenditure of time and money. These names constitute a part of the good

will of a business, which enterprise and foresight have built up, and are considered just as much entitled to protection as a secret formula for compounding some material.

The customers of a particular business, however, cannot be strictly termed a property right, since a knowledge of them can easily be secured by legitimate effort. As a result, questions frequently arise regarding the circumstances under which an employer can have an employe enjoined from soliciting his customers for a business rival, after the employe has left his service. The following rules are in accordance with legal decisions.

1. If an employe surreptitiously copies the names and addresses of his employer's customers or carries away any document containing trade secrets or other confidential matter relating to the employer's business or if he has been furnished a list of customers by his employer for the purpose of soliciting trade, he will be enjoined from using these records in securing the patronage of such customers for himself or another employer; and anyone who obtains the records from the employe will also be enjoined.

2. If an employe solicits his old customers, leading them to believe that he is still working for his former employer, he will be enjoined.

3. In the absence of an express contract not to do so for a reasonable period of time after he ceases his employment, an employe will not be enjoined from soliciting business from the customers of his former employer, where by so doing no business secret or trust is violated, and anyone employing him will not be enjoined from using his knowledge. If this rule were otherwise, a salesman, every time he changed employers, if in a like business, would be compelled to give up all friends and business acquaintances made during the previous employment, and the court, as has been said, "has no power to compel a man who changes employers to wipe clean the slate of his memory."

The foregoing outline of the law of trade secrets should be sufficient to aid those engaged in any kind of business in protecting their secret processes, as well as in questioning the manner in which like knowledge, brought to them by former employes of others, was obtained. They can thereby guard against one of the expensive and vexatious litigation pitfalls into which many employers have fallen.

* * *

To restrict production and to raise prices as a general policy is, to me, not liberalism but reaction, not statesmanship but surrender, not creative advance but cowardly retreat. That way lies the subsidizing of inefficiency. That way lies a permanent and perilous lowering of living standards for the millions. To play down our productive powers may well result in a stabilization of want rather than a stabilization of welfare.—*Dr. Glenn Frank, president of the University of Wisconsin, in "America's Hour of Decision."*

Multiple Machining and Economy A Comment

By H. B. GARDNER, President
Mechanical Specialties Mfg. Co., Chicago, Ill.

Some comment seems to be called for regarding the production of sixty thousand 30-pitch gears referred to in the article "Multiple Machining and Economy" in August MACHINERY, page 708.

This appears to be another instance of misdirected zeal in the quest for economy. The manufacturer of these gears should have looked into the cost of having them cut in a gear-cutting shop adequately equipped to produce them efficiently and economically. Why should he design and build, or otherwise adapt, three special machines for this purpose, each of which was to produce one gear at a time?

This method was obviously slow and expensive, and it is not surprising that another method was sought; nor is it surprising that the swaging-coining method was also abandoned in favor of the original gear-cutting machines. arranged to cut two or three gears at a time. The subsequent installation of a hobbing machine was a logical evolution. All together, it appears that this manufacturer had made an investment of from $4000 to $5000 before he was equipped to produce his gears efficiently. In view of the fact that his entire annual requirements of sixty thousand gears could have been bought from a gear-cutting shop for less than $1000, it is clear that his experience was decidedly expensive.

Even granting that he is now equipped to produce all of his requirements in his own plant, the "saving" (?) in the spread of his overhead will not compensate for the idle time of the equipment, to say nothing of the higher rate that must be paid to a competent gear man who will not spend more than half of his operating hours on gear work.

* * *

Organized Courses in Electric Welding

The Lincoln Electric Co., Cleveland, Ohio, in conjunction with the John Huntington Polytechnic Institute, also of Cleveland, has conducted a number of courses in welding and welding engineering, and is planning, during the remainder of this year and during 1935, to conduct several other courses to be given at the plant of the Lincoln Electric Co. and at the John Huntington Polytechnic Institute.

Coming courses will begin on December 17, 1934; January 7, February 11, March 18, April 15, and May 20, 1935. The courses last five days, during which time an intensive study of welding is carried on with demonstrations, practical work, and lectures. A charge of $10 is made for the entire course. Further information may be obtained from the Lincoln Electric Co., 12818 Coit Road, Cleveland, Ohio.

Electric Trucks for Handling Heavy Dies

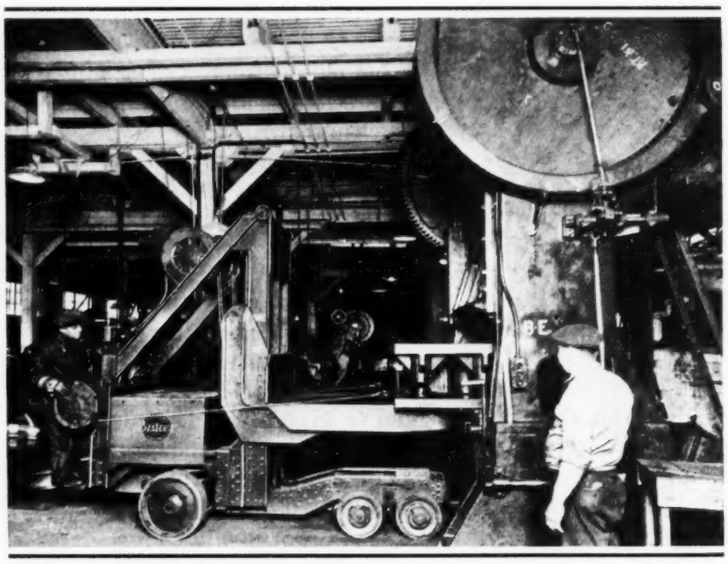
THE heavy-duty die-handling electric trucks here illustrated have established marked time-saving records. With these electric trucks, heavy dies can be easily, quickly, and safely transported from the machine shop to the storage room. The Baker Industrial Truck Division of the Baker-Raulang Co., Cleveland, Ohio, has brought out these trucks in 15-, 20- and 25-ton capacities, developed especially for transporting automobile body and fender dies. They can also be used advantageously in any application where heavy castings, assemblies or materials must be handled.

These trucks are equipped with heavy-duty double-cable winches, by means of which the dies can be removed from the press bed to the platform of the truck. By reversing the cables over sheaves on the bed of the press, the dies can be transferred from the truck platform to the press bed. The carriage rollers and sheaves are mounted on ball or roller bearings to insure free movement of the carriage.

The steering mechanism operates on all six wheels through a Ross cam-and-lever steering gear with a spur gear reduction which permits the operator to control the movement of the truck with ease. A metal drum controller, acting as a limit switch, limits the upward and downward motions of the platform, and provides an automatic cut-out in case the carriage should be obstructed in its downward travel.

An example of a typical saving made possible by the use of this modern means of die-handling is furnished by one of the users of this equipment who says: "This truck has made a tremendous difference to us right from the start. We find that dies that took approximately seven hours of machine time to change under the old system are changed in about an hour and a half with the die-handling truck."

In addition to this saving of five and a half hours in machine time, there are savings in man-hours through both the reduction in time and the reduction in the number of men required in changing a heavy die. There is also an almost complete elimination of injuries which, under the old system, were very frequent, due to lifting strains and slipping of the load. Another important advantage gained with this equipment is that danger of damage to the dies is greatly reduced.



(Above) Power-operated Cables of Die-handling Truck Quickly and Safely Pull Die from Press Bed to Truck Platform. (Left) Heavy Dies can be Quickly Transported from Machine Shop to Storage by Electric Die-handling Trucks

The Gearmotor and its Possibilities

By S. B. BRITTAIN, Gearing Products Specialist
Westinghouse Electric & Mfg. Co., Detroit, Mich.

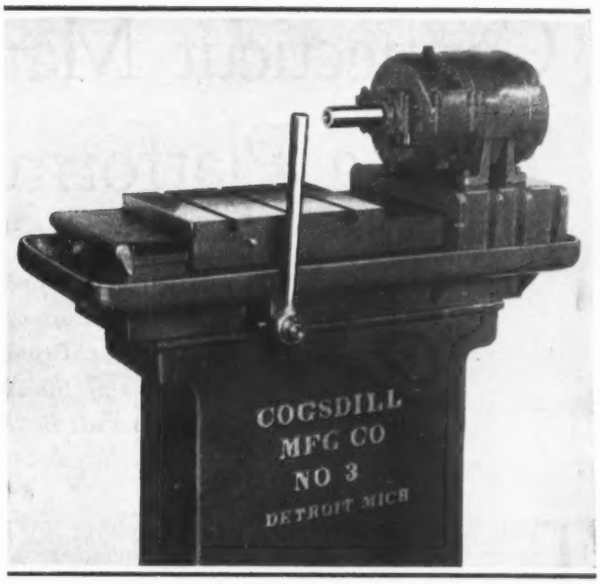
THE combination of a motor and a speed reducer, which has been designated a gearmotor, is the result of a long process of evolution. From ropes, belts, open gears, and coupled speed reducers has evolved a compact, efficient, and dependable drive. New fields of application for the gearmotor have quickly become evident for two reasons: First, low initial cost and second, compactness. As for cost, appreciable savings are frequently evident in comparing the initial cost with that of the conventional, parallel-shaft speed reducer, complete with motor, high-speed coupling, and bedplate; yet the quality of workmanship and materials remains unchanged. A study of the space requirements is also very impressive as regards the advantages of the gearmotor over the older types of speed reducers.

In the case of a 15-horsepower drive having an output speed of 350 revolutions per minute and a motor operating at 1750 revolutions per minute, there is a saving of 38 per cent in length, 20 per cent in width, 18 per cent in height, and 55 per cent in weight when the gearmotor is used. Another 15-horsepower drive having an output speed of 175 revolutions per minute with a motor operating at 1750 revolutions per minute, gives a possible saving of 32 per cent in length, 32 per cent in width, 40 per cent in height, and 59 per cent in weight.

The horizontally split gear-case construction used in a gearmotor design is a desirable feature in that it makes possible the periodic inspection of all mechanical parts without disturbing the gear centers or removing the drive from its foundation. With this construction, neither the electrical connections nor the low-speed coupling need be disconnected when making such inspections.

Protection of Mechanical Elements

The plant engineer is primarily interested in buying horsepower and speed at the output shaft. For this reason, the method used in designing and rating all gearmotors should be to incorporate sufficient strength in all mechanical parts, such as gears, shafts, and bearings, to safely transmit torque from any type of winding required for the widespread field of application. The design should also permit overhung loads of any normal nature. It is exceedingly gratifying to the user as well as to the manufacturer of the gearmotor that no service factor table or chain pull chart need be used when utilizing a design of this nature.



A Gearmotor Used as a Headstock for a Bearingizing Machine

The balanced electrical and mechanical design, combined with the inherent advantages of the gearmotor, adapts it for application to machine tools, conveyors, pumps, fans, hoists and miscellaneous types of process machinery. Many problems can be solved with the gearmotor. A double extended motor shaft, for example, permits the use of a magnetic brake. Such a shaft can also be connected to some high-speed load. There is also the possibility of using a gear head on each end of the motor, thereby obtaining the same or different output speeds. This arrangement would be readily adaptable to lineshafts.

One machine tool builder found it possible to replace the entire headstock of a machine with a gearmotor, as shown in the accompanying illustration. In this case, a special low-speed shaft was incorporated in the gearmotor. This shaft was taper-bored to accommodate the cutting tool.

Protection of Electrical Elements

The windings and other electrical elements of the gearmotor can be protected by a "Thermoguard" incorporated in the motor. This safeguarding device is a bi-metal disk type thermostat arranged to either stop the motor or sound a distress signal before overheating from any cause can reach the danger point. Thus the motor is protected from damage by abnormal voltage, too frequent starting, high room temperature, phase failure, frequently repeated overloads, or other conditions that would ordinarily cause a "burn out."

Connecticut Manufacturers Propose a Platform for Industry

The Manufacturers' Association of Hartford County, Conn., has Issued a Statement of Principles and Policy with Respect to the Proper Province of Governmental Activities and the Activities of the NRA. This Statement is Published in Full in the Present Article

THE National Industrial Recovery Act, by its own terms, expires on June 16, 1935. It was protested at the time of passage by many manufacturers in this county. Subsequently, these manufacturers, though in doubt as to its constitutionality did, nevertheless, observe its provisions. Its presumed benefits, in general, have failed to materialize. Its burden has been excessive.

We are firmly convinced that the unprecedented disruption of sound industrial relations in our factories was and is stimulated and fostered by Section 7a of that Act and the improper and inadequate interpretations afforded by the Administration. We submit, and are confident in available proof, that it was not productive of substantial relief in the matter of unemployment. We feel that the license afforded federal agency for intervention in private industry within the states is unsound.

We contend that the National Industrial Recovery Act is wrong in principle. Its re-enactment in any guise would be illogical and fruitless, regardless of emergency. We hold that certain principles must at all times be observed. Fundamental among these is that which shall guarantee to the individual his right to work without interference, coercion, intimidation, or undue solicitation from any source whatsoever. If the right of labor to organize and collectively bargain, as a voluntary proposition, is an accepted right—a legal right—then it needs no reiteration and stimulation in any legislative enactment pertaining to a program for industry. Furthermore, there must be definite commitment and assurance by the Government that the open shop plan of employment in industry shall be protected as an American principle.

We contend that the appropriate way of making voluntary, limited, mutual agreements within an industry to restrain unfair trade practice is through the Federal Trade Commission, and not under a wholesale system of imposed code practice. If price stabilization, price control, and production control are desirable goals for certain industries, they should receive consideration by that body on their own merits.

With regard to maximum hours, we contend that their limitation, other than beyond unreasonable bounds, should not be sought through legislative regimentation of all industry. No inflexible circumscribing of hours of productive operation can redound to the benefit of any program of recovery. We are opposed to child labor in industry. Whatever remnants of the child labor evil were left in this country at the time of the enactment of the present law were fast disappearing in the face of public opinion. However, no objection can be advanced against reasonable limitation of the hiring, in industry, of children under sixteen years of age. But we hold this to be a matter for state legislation.

Minimum wages, presumably a keystone in the present system, have proved of slight significance in the majority of industries. Where their importance in certain industries is recognized as a factor in competitive relations, their stabilization should be effected in whatever voluntary agreement is approved by the Federal Trade Commission.

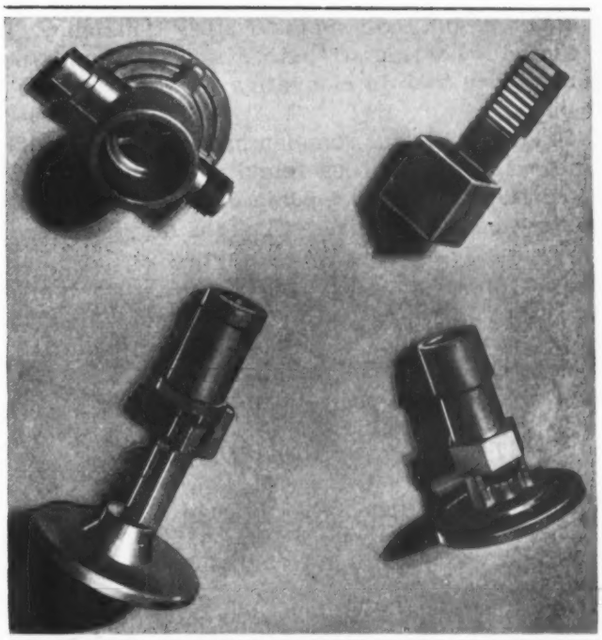
We declare that the friendly, voluntary association of representatives of industry for the betterment of competitive relations within an industry, with due regard for the public interest maintained by the judicial branch of the Government, is right and due. But we do not concede as comparable or equitable the forced unionization of independent workers by labor organizations, with or without the assistance of the Government.

We demand a recession by the Government from competition with private industry. This evil is working to the permanent destruction of individual initiative and enterprise, our sinews of progress, and the source of taxes for Government operation.

We contend that no proclaimed emergency, either by the Chief Executive or by Congress, should be allowed to contravene or vitiate the spirit and intent of the Constitution of the United States. The doctrines of individual freedom and states rights laid down in the Constitution and upheld by subsequent judicial decisions must be adhered to. We challenge the use of the boycott, libel, and other extra legal instruments which Administrative agencies have adopted to enforce their will, right or wrong, upon the people of this country.

Brass Alloys that Can be Die-Cast

Abstract of a Paper Presented at the Recent National Metal Congress, which Records the Progress Made in the Die-Casting of Brass



DIE-CASTINGS of metals having a low melting point have been available for many years, but the development of brass die-castings has occurred only within the last five years. In a paper presented before the recent National Metal Congress by John R. Freeman, Jr., of the American Brass Co., Waterbury, Conn., the author pointed out that the successful die-casting of brass has been made possible by the development of alloy steels that have a satisfactory life when used for dies subjected to high temperatures and by the development of suitable die-casting machines.

The melting point of copper is 1084 degrees C. (1983 degrees F.), while that of a high brass is about 900 degrees C. (1652 degrees F.), as compared to 327.5 degrees C. (621.5 degrees F.) for lead, 419.4 degrees C. (786.7 degrees F.) for zinc and 658.7 degrees C. (1217.7 degrees F.) for aluminum. These temperatures are indicative of the casting temperature required for the various types of alloys, the melting points of the alloys being somewhat lower than for the pure metal.

Two Types of Die-Casting Machines in General Use

In the well-known plunger and goose-neck types of die-casting machines used for casting alloys of relatively low melting point, much of the working mechanism is immersed in the molten alloy. For alloys having the high melting point of brass, this is obviously impossible. Machines with a separate melting chamber are therefore essential.

Mr. Freeman mentioned that two rather distinct types of die-casting machines are in extensive use at the present time, the Pack and the Polak machines. The former was designed by Charles Pack and developed at the plant of the American Brass Co., while the latter was developed by Joseph Polak of Prague, Czechoslovakia. In both types of machines, the metal to be cast is maintained at the proper casting temperature in a holding pot from which it is ladled as required into the "cup" or pressure chamber of the die-casting machine.

The alloys that can be die-cast commercially in either of the two machines mentioned are limited only by their melting point and the consequent casting temperature required. At the present time, the higher melting-point alloys cannot be cast, due to the limitations of the die steels available. Brass having a composition of 60 per cent copper and 40 per cent zinc has the lowest melting point of the commercial brasses, and for this reason, is most widely used in the manufacture of brass die-castings. Other elements, however, are added to obtain certain characteristics more or less peculiar to the die-casting process. The plastic range of the high brasses is quite narrow, but may be greatly increased by the addition of a small percentage of lead, due to the fact that it is unmixable when in the molten condition in brass alloys. Lead also, as is well known, confers machineability upon brass. It reduces markedly the ductility and, in excess, introduces hot-shortness.

In die-casting, the metal must be maintained at the casting temperature in the holding pot for appreciable periods, during which it is uncovered and subject to continual oxidation by the atmosphere. In the plastic or "mushy" state, the oxide formed is not readily skimmed from the surface. The addition of about 0.1 to 0.2 per cent aluminum has been found to retard this oxidation, and appears to be quite generally used both in European and American practice.

Aluminum also reduces the vaporization of zinc in the holding pot and diminishes the deposit of zinc oxide on the die surfaces. Tin is also added. This gives increased fluidity to the alloy in the casting, tends to check the segregation of lead in the holding pot when semi-plastic metal is being used, and increases the corrosion resistance of the final casting.

The alloy found most suited for general die-casting purposes in both types of machines has the following nominal composition: 60 per cent copper,

1 per cent tin, 1 per cent lead, about 0.10 per cent aluminum, and the remainder zinc. This alloy has a minimum tensile strength of 55,000 pounds per square inch and an elongation of 9 per cent in 2 inches.

In addition to the common brasses, certain high-silicon alloys have been found well suited for die-castings. They have a comparatively low melting point—about 900 degrees C. (1652 degrees F.). A very satisfactory alloy of this type has the following nominal composition: 81.50 per cent copper, 4.25 per cent silicon, 0.15 per cent manganese, and the remainder zinc. This alloy has a minimum tensile strength of 85,000 pounds per square inch and an elongation of 8 per cent in 2 inches.

The Place of Brass Die-Castings

Brass die-castings, according to Mr. Freeman, occupy a position between brass forgings or die pressings and brass sand castings. They are supplemental to die pressings rather than competitive, although they may at times be substituted for the latter, particularly when coring will eliminate extensive machining operations. Die-castings make available complicated shapes with rather intricate coring, cast to more precise dimensions than sand castings and having a superior surface finish.

Brass die-castings made in the Pack and Polak machines under relatively high pressures and in dies of correct design are practically free from visible internal cavities, but they do contain microscopic blow-holes and shrinkage cavities. Mr. Freeman pointed out that die-castings do not have the inherent soundness of forged metal, and therefore should not be used under excessive hydrostatic pressures or for parts, the failure of which would constitute an extreme hazard. However, die-cast brass fittings have been subjected to hydrostatic test pressures as high as 800 pounds per square inch without showing failure or leakage. This is indicative of the sound character of the castings available. The illustration shows several types of brass die-castings that have been produced in large numbers.

* * *

Fewer Sizes of Milling Cutters

A substantial decrease in the number of stock sizes and varieties of milling cutters has been agreed upon by the makers and users of cutters. The new sizes are listed in the Simplified Practice Recommendation R36-34, published by the Division of Simplified Practice, Bureau of Standards. Copies can be purchased for 5 cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C. Diameters, thicknesses, and other important dimensions of milling cutters, including plain milling, involute gear, screw slotting, and keyseat cutters, as well as end-mills and slitting saws, are covered in the recommendation.

A Weighing Scale that Automatically Records Weights

A so-called "Printweigh" scale built by the Toledo Scale Co., Toledo, Ohio, makes possible entirely new methods of maintaining inventory records and of checking incoming shipments, as well as of recording the amount of material being used in cupola mixtures, chemical compounding, etc. This scale is so arranged that, with accounting forms specially prepared to suit the scale, it will record directly on the inventory or accounting forms, and in the proper place on these forms, the exact weight of the product being weighed.

This is a great step forward in the methods used for checking incoming shipments, as well as in the maintaining of accurate inventory records. When the weigher is expected to write down on a card in pencil the weight read off on a scale, there are always possibilities of error. Furthermore, in checking incoming shipments, it has been found in a great number of instances that have been carefully checked, that there is a tendency on the part of the checker to check off the weight on the invoice as correct unless the discrepancy is marked.

In weighing up batches of different materials to be used in a charge or in a chemical compound, usually no record is kept, dependence being placed upon the weigher to weigh out the correct number of pounds of each material. If something goes wrong afterward, there is no possibility of checking whether or not the correct amounts of materials have entered in the charge or mixture. When a recording scale is used, the actual weights of every ingredient are printed by the scale as a permanent record; and, if any question arises later, it is possible to check what went into the mixture.

There are numerous other applications for a scale that will permanently record weights, but the instances referred to will suggest other cases where this kind of record will prove valuable.

* * *

Nickel Steel for Railroad Service

Nickel-alloy steel being used for axle gears, pitch drums, and bevel gears, pinions, and shafts has given good account of itself in a gear drive for axle-driven generators for railway car lighting and air conditioning that is being built by Foote Bros. Gear & Machine Co., Chicago, Ill. One of these drives is still in good condition after 270,000 car-miles of service in a great variety of climatic conditions, including operation through sandy desert country. A minimum of maintenance expense is recorded, and examination of gear sets that have been running for long periods of time shows that there is no need of attention aside from periodical lubrication. The alloy-steel gear teeth themselves have shown no wear after these long periods of service.

Tungsten Carbide Reduces Tool Sharpening

By CHARLES O. HERB

Widia Tools That Machine Parts Within Tolerances of Only 0.0005 Inch Last as Long as Eight Months Between Lappings in a Prominent Sewing Machine Plant

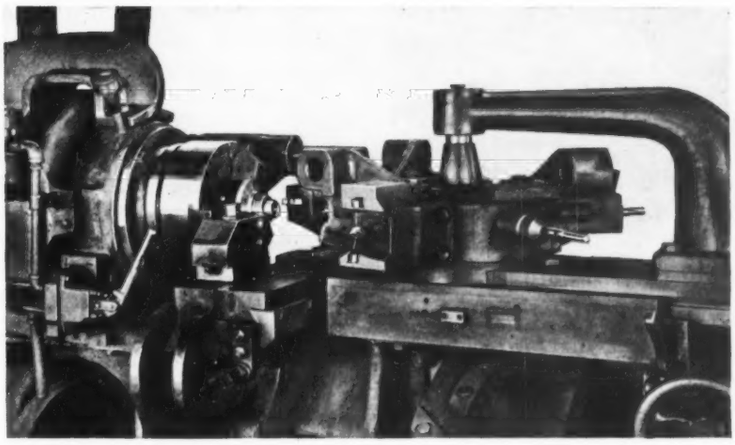


Fig. 1. Eight Widia-tipped Cutters Used for Turning and Facing Cuts Have Greatly Lengthened Tool Life in This Operation

TOOL maintenance is an important problem in producing parts consistently to very close limits, because production is lost and tool-room expense created each time that a machine must be stopped for regrinding the tools. The longer a tool can produce between grinds, the more economical the machining method employed, provided, of course, that the cost of the tool bears the proper proportion to the results obtained.

At the Elizabethport plant of the Singer Mfg. Co., large savings are being effected through the use of Widia tungsten-carbide tools for machining cast iron, bronze, and aluminum parts. Most of the tools last five or six months between lappings, and in several instances, the life between resharpenings is eight months. Tungsten-carbide tools have been found to remain sharp much longer when they are lapped than when they are merely ground.

One of the tungsten-carbide tools that lasts eight months between lappings bores a hole 1 inch in diameter by 5/16 inch long, about 0.020 inch of stock on the diameter being removed. The tolerance on this hole is 0.001 inch, and the part is made of aluminum. The weekly production averages 1200 parts.

In another example, a hole 1/4 inch in diameter by 9/16 inch long is bored in an aluminum die-casting, about 0.010 inch of stock on the diameter being removed. This tool lasts for approximately 7000 pieces between resharpenings.

Increased tool life and accuracy of the work are not the only advantages obtained at the Singer plant by using tungsten-carbide tools. There are multiple operations in which cuts are being taken simultaneously on fast running large-diameter surfaces with cutters of this type, while surfaces of smaller diameter are being machined by high-speed steel or Stellite cutters. If it were not for the tungsten-carbide tools, the surfaces of larger diameter would have to be machined at slower speeds or in an additional operation.

The operation illustrated in Fig. 1 consists of taking a multiplicity of cuts for the purpose of machining the balance wheel casting seen at the left in Fig. 2, to the form illustrated in the middle. In this operation, the large conical face *X* is rough- and finish-faced by tungsten-carbide tipped form cutters at the same time that other cuts are being taken on the hole and on smaller diameter surfaces. Cutters mounted on the turret are used for both

Fig. 2. Rough, Semi-finished and Finished Balance Wheels in the Machining of which Tungsten-carbide Tools have Effected Large Economies

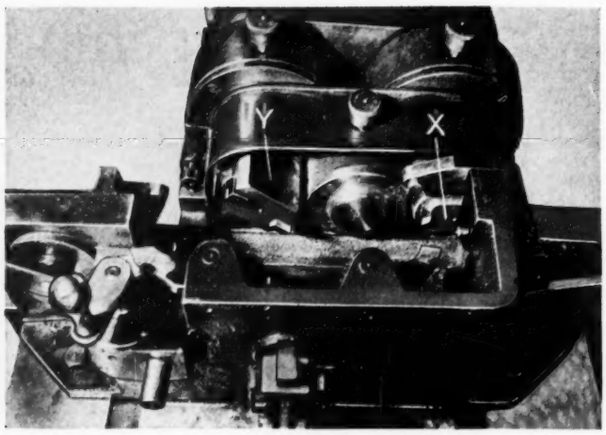


Fig. 3. Both Spindles of This Machine are Provided with a Two-bladed Tungsten-carbide Cutter for Finishing Flat Surfaces on an Aluminum Casting

rough- and finish-facing surface *X*, two cutters being employed for roughing and one for finishing. The use of these tools has cut the time of this operation in half.

The turning tools used in this operation are also tipped with tungsten carbide, as well as the boring tool and facing cutters used on the small-diameter faces. All together, there are seventeen tools in this set-up, eight of which are tipped with tungsten carbide. The balance wheel is 4 5/8 inches in diameter and its rim runs at about 200 feet a minute during practically the entire operation, the speed being temporarily reduced for forming the annular threads. A back-facing cut is taken in this operation by means of a tool that operates through the center of a special hollow air-chuck spindle.

The tungsten-carbide tools used in this operation for taking finishing cuts are "touched up" once every six weeks, but the roughing tools last anywhere from two to six months between lappings. When high-speed steel cutters were tried out for facing surface *X*, they had to be changed every two and a half days.

The machine used for this operation was designed specifically for the job. The use of tapered roller bearings for the spindle has eliminated all vibration of the work, which is of prime importance when using tungsten-carbide tools.

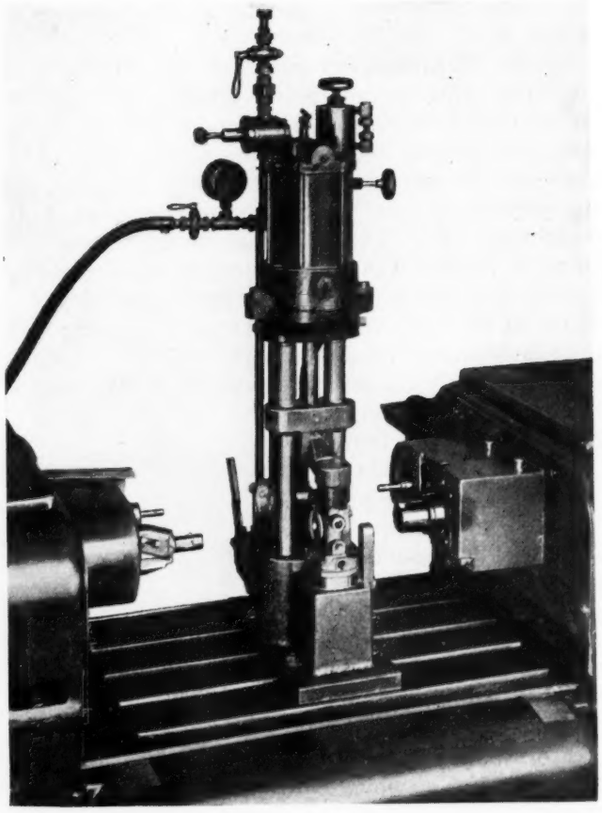
The rim of the balance wheel and the side seen in the right-hand view of Fig. 2 are rough- and finish-machined in a second operation, performed in a vertical type of machine. Three tungsten-carbide cutters are used in this operation. The depth of cut in roughing varies from 1/16 to 1/8 inch. The rim of the balance wheel revolves at a speed of about 325 feet a minute.

Flat surfaces are finished in a number of cases by what may be termed "single-point" or "two-point" milling. By the use of only one or two cutter blades in such operations, the tool investment is low, as compared with the cost of multiple inserted-blade milling cutters, and in the event that a hard spot in a casting damages the cutter, the loss is correspondingly reduced. Also, because of the light pressure exerted by the tools on the work, lighter means can be employed for chucking the work, and hence there is less chance of the castings becoming distorted.

The machine shown in Fig. 3 has two spindles, each of which carries a two-bladed tungsten-carbide cutter. These tools finish two flat pads on an aluminum die-casting.

Both surfaces milled in this operation must be at the specified height above four bored holes within plus or minus 0.001 inch. Approximately 6000 of the aluminum castings are milled between resharpenings of the cutters, in spite of the fact that the cutter blades must jump across large openings. The corners around the openings are produced clean and sharp. About 0.020 inch of stock is removed by each pair of tools.

Fig. 4. Double-end Bore-Matic Tooled Completely with Tungsten-carbide Cutters for Machining a Small Motor Housing—These Tools Have a Life of from Two to Six Months Between Lappings



The cutter-spindles of this machine are also mounted in tapered roller bearings to eliminate chatter or vibration.

Boring and Facing Motor Housings Complete with Tungsten-Carbide Tools

Aluminum motor housings of somewhat intricate design are machined in two operations performed in the double-end Bore-Matic illustrated in Fig. 4. This machine uses tungsten-carbide cutters only. Five holes varying in diameter from 1/2 to 3 1/8 inches are bored in two settings in this machine, and in addition, several facing cuts are taken. The tungsten-carbide tools last from two to six months between lappings. The production averages 1200 pieces a week.

The tolerance allowed on the small bores in this operation is 0.0005 inch, and on the larger holes, 0.001 inch. An important point in the operation is that one of the larger holes is interrupted by a large square opening, so that a jump cut is involved. Rigidity of the cutter-spindle is, of course, a vital point here, as in the preceding examples. The larger diameter surfaces of this motor housing are machined with cutter speeds of from 1200 to 1400 feet a minute. The stock removal varies from 0.015 to 0.020 inch on the hole diameters.

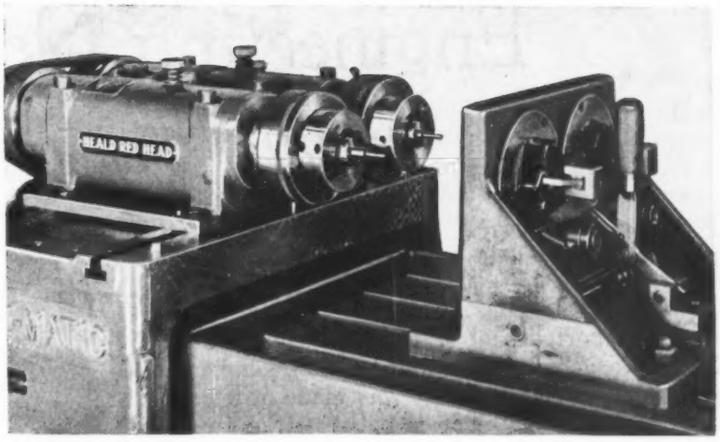


Fig. 5. Single-end Bore-Matic Equipped with Tungsten-carbide Tools that Bore and Recess End-covers, Producing 8000 Pieces between Lappings

Eight Thousand Small Bronze Bushings Bored between Lappings of Tungsten-Carbide Tools

The small motor end-covers seen in the machine in Fig. 5 are die-castings with a small bronze bushing cast in place. The 1/4-inch hole in this bushing must be bored to size within a tolerance of 0.0005 inch. In the same operation, a seat 3 1/8 inches in diameter is cut in the face of the part. Both tools are tipped with tungsten carbide and last for approximately 8000 pieces between lappings. The operation is performed in a single-end Bore-Matic, equipped with two boring heads and two work-holding fixtures so that two slightly different motor end-covers can be machined at the same time. As in the case of the motor housing previously referred to, these end-covers are machined after they have been enameled.

Progress in Machine Shop Practice

In the annual Progress Report of the Machine Shop Practice Division of the American Society of Mechanical Engineers, of which Division R. E. W. Harrison, chief of the Machinery and Agricultural Implements Division of the Department of Commerce, Washington, D. C., is secretary, a number of tendencies in the machine shop field are emphasized. It is pointed out that useless work of metal removal is being more and more eliminated by making forgings and castings with the minimum amount of surplus metal. The tendency to minimize the amount of machining work is also evidenced in the increasing use of die-castings and hot-pressed brass parts, as well as in the growing use of synthetic plastic compounds.

Other tendencies pointed out in the report are a wider use of surface broaching, which has resulted in a number of new broaching machines being placed on the market; a more critical attitude toward accepting the hydraulic principle for operating machine tool mechanisms without question, the decision now being more and more influenced by economic and mechanical features; and the advent of a completely automatic inspecting machine which inspects size, finish, roundness, parallelism, and weight at the same time, an inspection device that is used for piston-pins of automobiles. (This machine, as applied in the plant of the Ford Motor Co., was illustrated and described in the May number of MACHINERY, page 532.)

The development of a new grinding wheel using actual diamond fragments as the abrasive for use in grinding tungsten and tantalum carbide metal-cutting tools is also referred to. An investigation on cutting fluids now being carried on under the auspices of the American Society of Mechanical Engineers' Subcommittee on Cutting Fluids is expected to produce important data.

Engineering News Flashes

The World Over

Wireless Telephone from India to London

It is reported that a telephone conversation between Karachi in India and London was heard distinctly when the first test was made of a proposed wireless telephone service between the two cities. This is all the more remarkable, as the voice first traversed 2000 miles of ordinary telephone wire before being sent out from a wireless station.

Measuring Half-Cycles of Electric Current

Two things are essential if satisfactory welding is to be done on stainless steel, aluminum, and certain alloys. There must be a very heavy flow of current, and it must flow for a short, but accurately timed period. The high-speed weld leaves the surface of stainless steel as nearly as possible in its original condition. Aluminum must also be welded rapidly.

There is no particular difficulty in obtaining enough current, but it is less simple to make a control that allows the heavy current to pass for, let us say, exactly three half-cycles, and then cuts it off without flashing or burning.

A spot welder with Westinghouse Ignitron control does just these things. It permits accurate timing from one-half to as many cycles as may be needed. The small igniter dipped into a pool of mercury acts as a trigger and allows current to pass, but after having permitted the correct number of half-cycles to flow without obstruction, it puts up the bar and no more can pass. Two such tubes are needed, so that alternating current may pass through mercury pool tubes. The timing device that so accurately controls the flow of power is an electronic equipment which passes the very small control current directly to the Ignitron tubes without the use of an intermediate relay. The desired timing is set by the adjustment of a rheostat. When the timing is once set, it remains constant and makes each weld just like all the others.

German Railways Streamline Locomotives

The German State Railways are planning to increase the upper allowable speed limit of passenger trains from 85 to 105 miles per hour. In order to determine how the wind resistance can be reduced at high speeds, tests have been made with an engine fitted with a parabolic smokebox door and wind shields on the sides of the boiler and over the front of the cab. The wheels, side-rods, etc., are also covered. The tests are said to indicate that a saving of from 500 to 700 draw-bar horsepower is obtained in hauling trains at a speed of about 90 miles an hour. A new engine designed for a speed of from 95 to 105 miles per hour is streamlined so that it resembles an armored car.

Low-Powered Soviet Airplane

According to the *Economic Review of the Soviet Union*, trial flights have been made in Russia with a low-powered monoplane that has an 80-horsepower motor and is capable of carrying a pilot and one passenger. The plane can remain in the air for six hours without refueling, and has a maximum speed of 90 miles an hour.

Radio Conversation from Moving Automobile

A two-way radio conversation has been conducted between an automobile driving through the streets of Schenectady, N. Y., and Sydney, Australia, 10,000 miles away. The conversation—the first of its kind in radio history—was fairly clear and little difficulty was experienced in conducting it. The two-way conversation was continued for from fifteen to twenty minutes. The car used in the conversation was equipped by the General Electric Co. for the Boston police department. Boston will be the first city in the United States in which policemen in radio cars can carry on a two-way conversation with headquarters as easily as if they were talking over a telephone.

Welder on Tenth Floor Controls Welding Machine on the Ground

A new remote-control device for arc-welding machines has been made available by the Lincoln Electric Co., Cleveland, Ohio. This device is known as the "Lincontrol." The operator, who may be welding on the tenth floor of a building construction job, merely taps the electrode on the work several times and the voltage is automatically raised. He taps it a greater number of times, and the voltage is lowered. Thus, by merely tapping the electrode —making and breaking the electric circuit—the current output of the generator is controlled. No

additional apparatus need be carried by the operator. He can work at any distance from the machine and can regulate the current accurately without making trips back and forth to adjust the controls.

England Builds World's Largest Pumps

Three pumps claimed to be the largest in the world have just been placed in operation at St. Germans, near King's Lynn, Norfolk, England. These pumps, each said to be capable of discharging 1000 tons of water per minute, are built by the Gwynnes Pumps, Ltd. Each pump is driven by a 1000-horsepower oil engine.

Bronze-Welding Permits Quick Repairs

Bronze-welding is resorted to more and more for repair work. *Oxy-Acetylene Tips* refers to an instance where the center pivot casting on a locomotive crane had fractured; as this crane handled all the lumber from a mill, it became necessary to shut down operations until the fractured casting could be repaired. Those acquainted with this type of crane know how many gears and other parts are mounted above the center casting and will realize what a tremendous amount of work and time would be required for dismantling it. By bronze-welding this casting in place, however, the job was completed in one day and the mill was able to resume operation.

Long Life of Steel Sheets Exposed to the Weather

Much has been said recently in the technical press of the long life of electric motors and other electric equipment. It is, therefore, of interest to note the unusually long life of some structural materials exposed to weather conditions. Inspection of the sheet-iron roofs of 250 passenger cars of the elevated lines in Chicago recently revealed that the roofs installed in 1913 are still in excellent condition—after twenty-one years of service. The roofs are made from Toncan iron sheets, none of which have been replaced because of rust or corrosion. This is especially remarkable, since in a city like Chicago, these roofs are exposed to all kinds of weather, smoke, soot, and fumes from industrial plants, and therefore are subjected to a very severe test.

Device that Instantly Tells Light Intensity

Lighting methods in the average factory are only 60 per cent efficient and in offices even less. These startling facts have been revealed by a device developed by the Weston Electrical Instrument Corporation, Newark, N. J., which instantly measures the intensity of light. A photronic cell is employed in this instrument by means of which light energy is transferred into electrical energy. The cell is connected to a milliammeter which is provided with a scale, calibrated in foot-candles. No batteries or lamps are required.

Largest Galvanizing Furnace in Europe

The largest furnace in Europe for the automatic galvanizing of sheet iron has just been placed in operation in France. The heating is accomplished by gas from a revolving-gate gas producer, in order to obtain a regular heat and accurate temperature. Forty kilograms (88 pounds) of coal are required to be converted into gas for each ton of sheet metal galvanized.

World's Largest Freight Car

According to *Industrial Britain*, the Cravens Railway Carriage & Wagon Co., Sheffield, England, is constructing for the Soviet Government a railway car that is claimed to be the largest in the world. Since the gage of Russian railroads is greater than that of the standard gage adopted practically everywhere else in the world, the car is considerably wider than ordinary freight cars and its length is approximately 100 feet. The car weighs 90 tons and has a load capacity of 200 tons. It will be used for transporting the heavy machinery parts required in connection with the large hydro-electric plants now being built in Russia.

A Giant Timken Roller Bearing Made for Use in a Cement Mill and Designed to Carry a Load of Over a Million Pounds. The Bearing Contains 78 Tapered Rollers in Two Rows and Weighs Over 2 3/4 Tons

EDITORIAL COMMENT

Reports from a number of machinery builders, including some of the large machine tool builders, indicate that there is plenty of potential business ahead and but one thing is needed—confidence in governmental policies. The business cycle has continued along its time-honored course; the depth of the depression was reached some time in 1932 and a gradual improvement, with some setbacks, has been noticeable ever since.

This improvement can be either accelerated or retarded by the policies of the Government. Few men who have studied the conditions question that the effect of the actions of the Government during the first six or eight months of the year was a retarding one. But by recognizing that mistakes have been made and by changing its course of action, the Government can greatly stimulate industrial recovery.

The President's Unique Opportunity to Achieve Real Recovery

President Roosevelt is presented with an opportunity such as few presidents have had. He alone has it in his power to inspire industrial leaders with confidence in the future course of the Administration. With such confidence established, industry would be justified in going ahead with much-needed replacement and expansion programs. The result would be re-employment in the durable goods industries, increased demand for raw materials, and greatly augmented purchasing power, re-established not through Government credits but through productive work.

Were the President to so re-establish confidence, he would see his purpose of recovery accomplished.

The metallurgist is constantly being asked to meet new requirements. A few years ago, the main question in developing new alloy steels was: "How can we produce a steel having the greatest strength —the highest physical properties?" This problem having been satisfactorily solved for present needs, it was found that some of the alloy steels were extremely difficult to machine. Then the metallurgist, in addition to providing a steel having great strength and reliability, found it necessary to determine what qualities in steel made for machineability, and to develop compositions and heat-treatments that would make the steel easy to machine.

Now the great development in welding has placed a new problem before the metallurgist. His steel must not only have the required physical characteristics and be easily machined, but it must be adapted to the new welding processes—it must be "weldable." It was of particular interest to note at the recent National Metal Exposition in New York how thoroughly the importance of this point is recognized. Several of the steel companies in their exhibits stressed the weldability of their steels, showing by test specimens the reliability of the welds made. No sooner has the metallurgist solved one problem than new developments in industry place another before him.

Weldability is Now an Important Quality in Steel

At the recent meeting of the Production Division of the Society of Automotive Engineers in Detroit, the important subject of cutting oils was accorded an entire session on the program. It was pointed out that the literature on cutting oils is very scant. Little has been published on the subject giving definite and conclusive information of value to the shop executive who is interested in knowing whether or not he is employing the right kind of cutting oil for the work in hand.

Production Engineers Would Welcome Information on Cutting Oils

Here is an opportunity for a progressive producer of cutting oils to go on record with information which would be eagerly absorbed by industry. The oil companies, who have carefully studied the subject for years, could doubtless place on record much valuable information, and the engineering journals are eager to act as intermediaries in bringing this information from the oil companies' research departments to the cutting-oil users. A real service would thereby be rendered to the mechanical industries, and a gap would be filled in the literature of engineering materials.

Ingenious Mechanical Movements

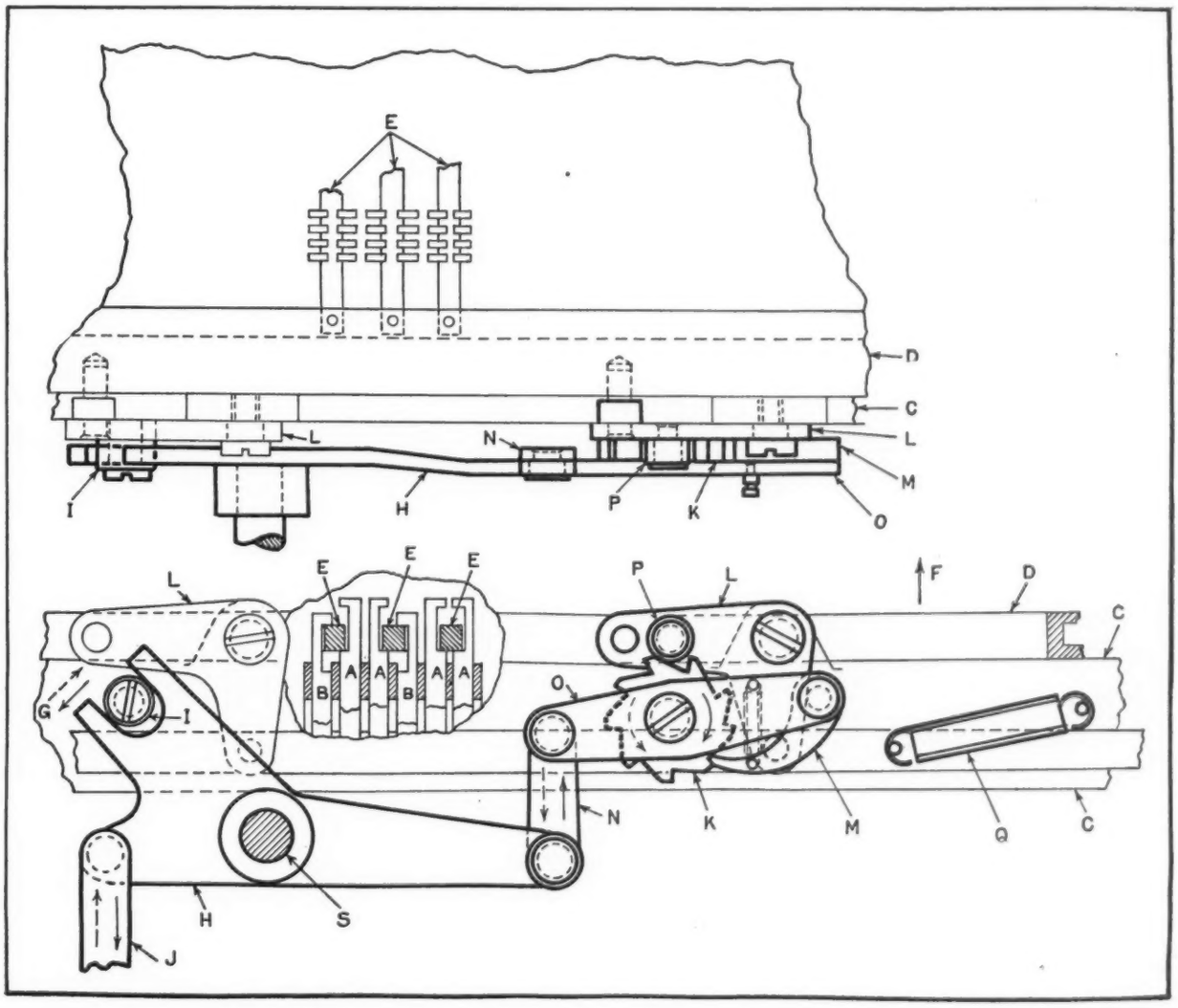
Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Mechanism for Oscillating a Part Mounted on Moving Members

By A. R. KLIGMAN

Sometimes a designer finds it necessary to provide means for imparting a short, quick oscillating movement to a machine part on a member that is also in motion. The mechanism shown in the accompanying illustration was designed to meet such a requirement. In this mechanism, the part or unit *D* is required to have a quick movement upward from the frame or part *C* in the direction indicated by arrow *F*, and then return to the starting position. This movement takes place while frame *C* is moving through the downward cycle of its oscillating movement, the direction of which is indicated by the full arrow at *G*.

The mechanism shown is a stop-pin bed used in a type-casting machine for the purpose of selecting groups of type. The bed consists of a multitude of flat stop-pins, slidable in a honeycomb holder.

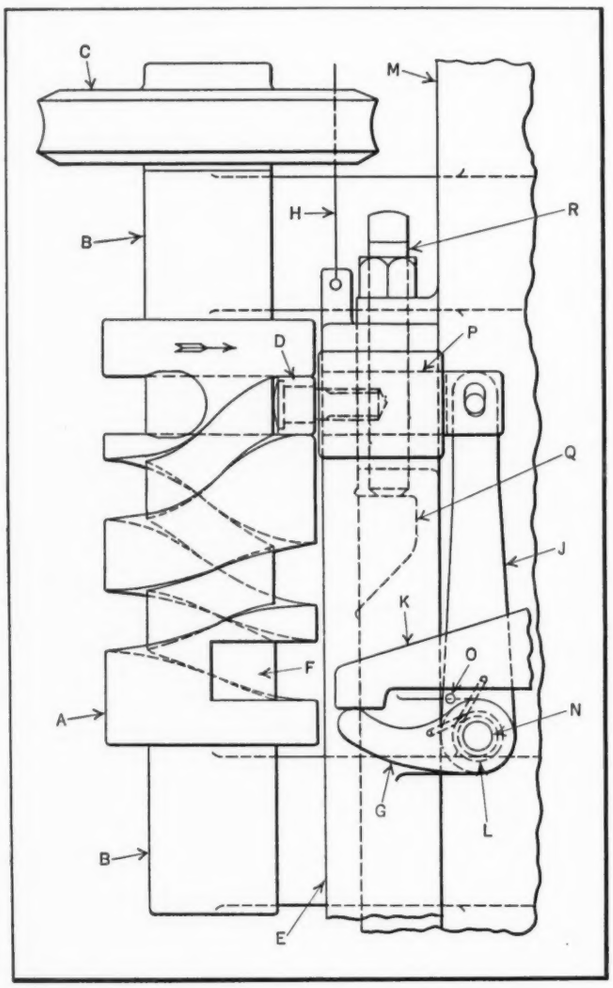


The Parts Shown by Heavy Lines are Applied to a Type-casting Machine to Produce an Oscillating Movement of Frame D in the Direction Indicated by Arrow F while the Frame C Moves Through the Downward Cycle of an Oscillating Movement in the Direction Indicated by the Full Arrow at G

Some of these pins *A* are shown in the restored or cleared position, while others, such as those marked *B*, are shown in their depressed positions. These stops are arranged in rows, and in plan view present a two-dimensional field in which code patterns can be depressed.

Frame *D* is built above bed framework *C* with a number of bars *E* attached to it, and forms a sort of rigid grate which, when raised at right angles to the bed in the direction indicated by arrow *F*, restores all the depressed stops *B* to the clear positions *A*. When lowered into contact with the frame *C* as shown, the restoring unit, consisting of the members *D* and *E*, permits a new pattern to be depressed in the stop-pin bed to suit the new cycle.

Now, it is necessary to perform this clearing operation by raising and immediately dropping the unit consisting of members *D* and *E*, while the bed section is making a short, quick stroke in the direction *G*. This is effected by means of a single outside connection—a lever *H* acting with the bed frame through a roller and slot at *I*. The lever is propelled by a cam (not shown) through link *J*.



Rotary Cam in which Roll is Disengaged at the Bottom of the Stroke to Allow the Slide to be Returned Rapidly by a Counterweight. Re-engagement Takes Place at the Top of the Stroke

Under one of the several interconnected bellcranks *L* provided to secure true parallelism in the motion of members *D* and *E* is mounted a ratchet *K*. This ratchet is mounted idly on a stud in the bed frame *C* and is made to act in combination with the roller *P* on the bellcrank *L*. A pawl *M* is arranged to receive its motion from the lever *H* through the connecting link *N* and rocking plate *O*, mounted idly on the same stud as the ratchet *K*.

It can be readily seen that during the stroke indicated by the dotted arrows there is skipping of the pawl *M* over the ratchet teeth, while during the stroke in the direction indicated by the solid arrows, the ratchet wheel is given positive indexing which forces the bellcrank *L* and the restoring unit upward. As soon as the crest of a ratchet tooth passes the roller, the frame unit is restored to its lower position on the bed frame by virtue of its weight, assisted by the tension in the spring *Q*.

The lay-out of the ratchet gear is such that, when the roller is in any of the ratchet tooth gashes, the roller clears the adjacent teeth by a slight amount. The stroke of the pawl is sufficiently in excess of the tooth spacing to cover this clearance and insure a full tooth spacing. The number of teeth in the ratchet is, of course, of no consequence, and such requirements as desirable size of the roller, easy camming of the roller by the back slope of teeth, available space for the whole device, etc., are factors governing the design of the ratchet.

Cam of Small Diameter for Imparting a Long Stroke with a Rapid Return

By J. E. FENNO

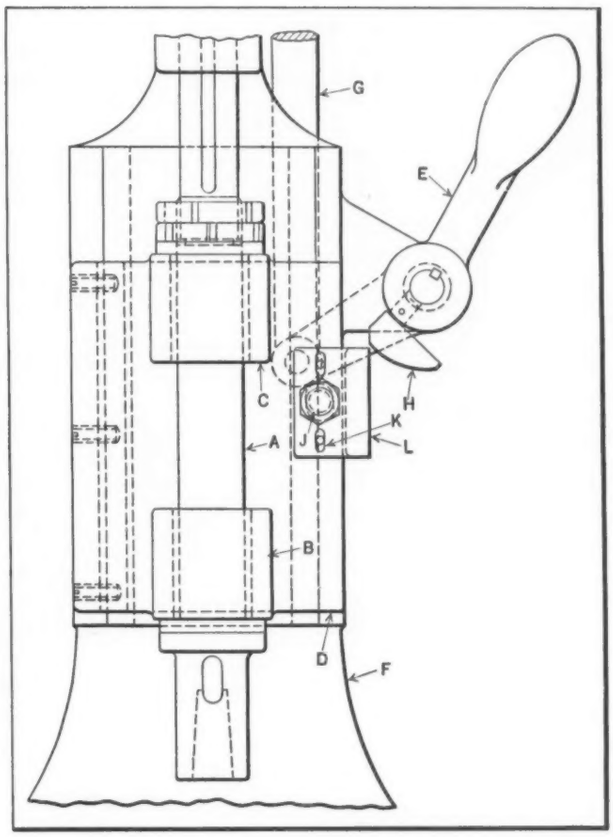
Cylindrical cams of the usual type for imparting a relatively long and powerful stroke to the follower must necessarily be large. Frequently this is undesirable because of the ungainly appearance of such a large cam, especially in a machine of light construction. For example, in designing a certain machine for inserting the packing in stuffing-boxes, a rather long stroke of a slide was required to press the packing into place. The return or idle stroke was to be as rapid as possible, in order to allow the operator time enough to reload the machine. Moreover, because of the light construction of the machine and the elevated position of the cam, it was desirable to have the cam of small diameter, as well as light.

To meet these requirements, the cam mechanism illustrated was developed. It consists of the cylindrical cam *A*, secured to a shaft running in the stationary bearings *B*. The cam is rotated by means of a worm (not shown) and worm-gear *C*, and is engaged by the follower roll *D* on the slide *E*. This slide is mounted on the machine column *M* and carries the levers *G* and *J* on the shaft *N*.

Although both levers are free to rotate on the

shaft, the lower lever *G* is normally held against the pin *O* in lever *J* by means of the coil spring *L*. The upper end of lever *J* is connected to a plunger *P*. This plunger slides in a bearing cast integral with the slide and carries the follower roll. A counterweight on cable *H* returns the slide to its upper position, the upward movement being limited by stop *Q* on the slide and adjusting screw *R* on the machine column. Stop *K* is fastened to the machine column and serves to operate levers *G* and *J* for engaging the roll with the cam groove at the top of the stroke as explained later.

In the position shown, the slide is about to begin its downward stroke. As the cam is rotated in the direction of the arrow, the slide moves downward until the roll has reached the part of the groove at *F*. Here the bottom of the groove is sloped gradually toward the outside of the cam; thus when the cam continues to rotate, the roll is forced out of the groove and the slide is returned to the upper position by the counterweight. Just before the slide reaches the upper position, the lever *G* comes into contact with the stop *K* and swings lever *J* with plunger *P* toward the left carrying the end of the roll stud against the cam. At the top of the stroke the roll is forced into the groove through the action of coil spring *L*. As the cam continues to rotate, the slide is once more carried downward.



Safety Device that Prevents Expanding Spinning Tool from Being Operated while it is Entering or Leaving Work

Device that Prevents Engagement of Clutch Until Slide is in Operating Position

By F. E. JUDSON

The rotating spinning tool of a machine for spinning an inaccessible joint in kitchenware had to be of the expanding and contracting type to allow access to the work. The machine clutch was required to be disengaged and the rotary movement of the tool positively stopped while the tool entered the work, as otherwise, the centrifugal force would cause the tool to expand and damage the work. To prevent the operator from accidentally leaving the clutch engaged at this time, the simple locking arrangement shown in the accompanying illustration was devised.

The tool-spindle *A* rotates in bearings *B* and *C*, which are cast integral with a vertical tool-slide *D*. This slide is fed downward by a foot-pedal, which actuates a rack and pinion. The foot-pedal and rack and pinion are not shown in the illustration, however. The machine clutch is operated by lever *E*, pivoted to the bracket cast on the machine frame *F*. This lever is connected to the clutch mechanism by a link *G*. The interlocking arrangement consists merely of the dog *H* on the hub of lever *E* and the stop *L*, which is secured to the vertical slide by a nut on the stud *J*. This stop is of angular shape and has a slight vertical adjustment to accommodate similar work of different sizes. The adjustment is provided by the elongated holes for the aligning pins *K* and stud *J*.

The slide is shown in its working or lowest position, and the stop is down far enough to allow dog *H* to pass when the lever is swung in a clockwise direction to engage the machine clutch. In swinging the lever for this purpose, however, the dog is moved toward the left, thus blocking the return of the stop, with the slide, while the clutch is engaged. After the work has been spun, the operator must shift lever *E* back again to disengage the clutch before returning the slide to its upper position. Thus, when the slide is at any other point than the lowest point indicated, the dog will come in contact with the stop and prevent the lever from being swung clockwise to engage the clutch.

* * *

Soviet Purchases in Great Britain

The orders placed in Great Britain by the Soviet Union have increased considerably this year over last. For the seven months' period January to July inclusive, the orders placed amounted to approximately $30,000,000, as against $12,000,000 for the corresponding period of 1933. Machinery and machine equipment accounted for about $4,350,000 of the purchases this year.

Multiple-Station Drilling on Small-Lot Production

By DAVID M. STRAUCHEN, Superintendent
The Cincinnati Milling Machine Co., Cincinnati, Ohio

Applications of Multiple-Spindle Machines Ranging from Simple Two-Spindle Types to Machines with a Large Number of Spindles and Special Indexing Fixtures Have Reduced Production Time and Labor Costs Considerably

AN upright drilling machine with two spindles, one beside the other, and a single table long enough to accommodate work under both spindles, probably constituted the first multiple-spindle drilling machine. This arrangement made it possible to move a simple jig from one spindle to the other and drill, ream, etc., with considerable reduction in tool handling and with fewer spindle speed changes, since the spindles could be run at different speeds. Such a drilling machine, together with a jig, tools, and a finished piece, is shown in Fig. 1.

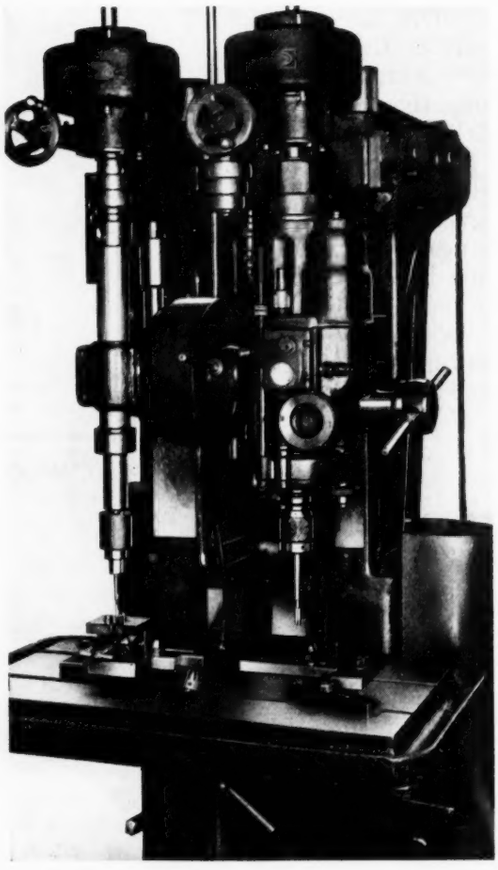


Fig. 1. Two-spindle Upright Drilling Machine Set-up, Showing Jig, Tools, and Finished Piece

The work, in this case, consists of drilling and tapping a small bevel gear. The first operation is to drill a 5/16-inch hole. After this is done, the jig is slid into position under the tap and a 3/8-16 tap is run in the hole. The time for the completed job is, of course, considerably less than it would be if the operator had to use one spindle and change tools and feeds and speeds after each operation.

The second spindle is, of course, not restricted to carrying a tap. It can be used for another drilling operation, for reaming, or for spot-facing or counterboring. Thus it is easily seen that a double-spindle drilling machine has decided advantages over a single-spindle machine of the same capacity.

Of course, much more complicated work can be done and is done on these machines, but this very simple application is shown because the idea for the first two-spindle machine, no doubt, was conceived when someone had a quantity of similar work to do and saw where he could cut time in half by using two spindles.

From the simple two-spindle application, we go to the four-spindle machine with quick-change collets for drills, reamers, and taps. Three spindles are arranged for drilling and reaming, and the fourth is equipped with a tapping head. The rotation of this head is reversed automatically when the pressure on the feed handle is released. All the spindles can be run at varying speeds to suit the operation to be performed.

Correct jig design and proper planning of what each spindle must do is all that is necessary to save considerable time and labor cost over the single- or double-spindle outfit, since we have again cut down the number of motions an operator must go through in making spindle speed changes, moving jig, changing tools, etc.

The four-spindle drilling machine is shown in Fig. 2, a finished piece being clamped in the jig resting on the table. The time for complete drilling

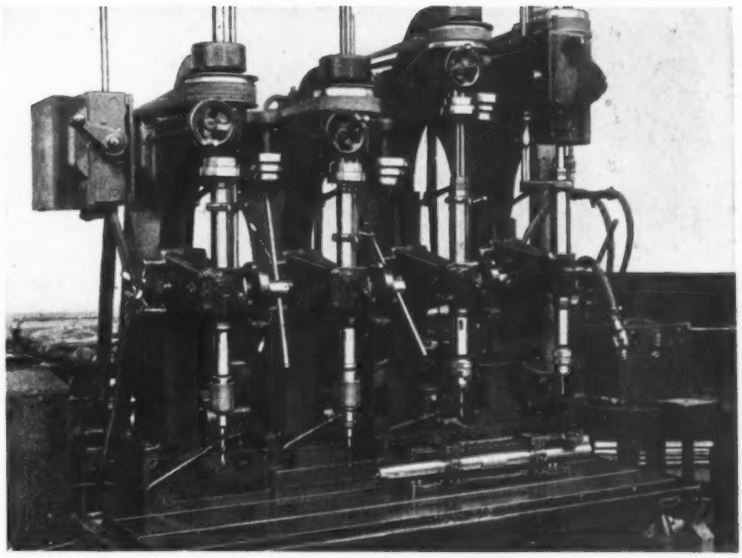


Fig. 2. Four-spindle Upright Drilling Machine Set-up, Showing Jig, Tools, and Finished Piece

and tapping of this piece is very much less than it would be if a single-spindle machine were used. The work consists of drilling two holes each for two slots, one large hole, and seven oil-holes, and tapping the large hole. Each of the different spindles carries a different size tool. The spindles are all run at different speeds according to the size of the hole, class of work, etc. Limits of 0.003 inch are maintained between the center distances of the holes.

A rather unique machine of the multiple-spindle type is shown in Fig. 3. In this case, there are two spindles arranged in a horizontal position, one for drilling and one for tapping. The work is carried on an indexing bracket in front of and in line with the spindles. This machine is adapted only to a limited class of work, but is extremely fast on anything that it will handle. It is very simple to operate and can be handled by comparatively inexperienced labor. It consists of merely placing the piece on the work-holding fixture, drilling a hole, and indexing the work into line with the tapping spindle, where the hole is tapped.

In Fig. 3 is shown a typical piece which is drilled and tapped, together with the machine and tools for doing the job. The piece shown is a brass collar for use on milling machine spindles. The four holes are 90 degrees apart, limits of plus or minus 2 degrees being placed on the part. The time set for performing the complete operation is 1.2 minutes per part. Two holes are drilled at one setting by simply feeding the drill through a cross-sectional hole that passes through the work-holding stud.

Punch marks on the upper face of the stud indicate the position of the holes, as well as positions 90 degrees from the holes. Thus, by revolving the collar around the stud so that the drilled holes line up with the punch marks at 90 degrees from the cross-sectional stud hole, the second set of holes can be drilled. The stud is then revolved about an axis through the lower part of the bracket carrying the stud, after which the tapping is done.

Tapping on this machine is similar to tapping on an upright press with a tapping attachment. As the work makes contact with the tap, the spindle engages in the counter-clockwise drive and the tap continues to advance into the work as long as pressure is maintained on the feed-lever. As soon as the pressure is released, the drive is reversed and the tap is backed out automatically.

The machine is also equipped with a shaft-holding fixture. This can be used for the efficient drilling and tapping of holes in the ends of shafts. The tapping spindle speed can be increased and the spindle used for reaming by simply turning a knob which disengages the tapping drive and engages a drive of higher speed.

The foregoing examples of drilling practice have been described with the idea in mind of tracing the history or evolution of multiple-spindle drilling down to more recent applications in

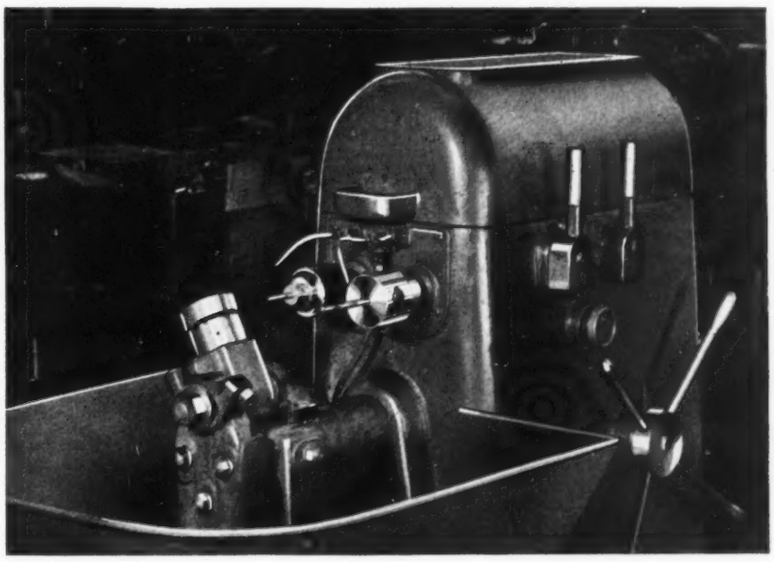


Fig. 3. Two-spindle Horizontal Drilling Machine with Indexing Fixture for Drilling and Tapping Part Shown in Machine

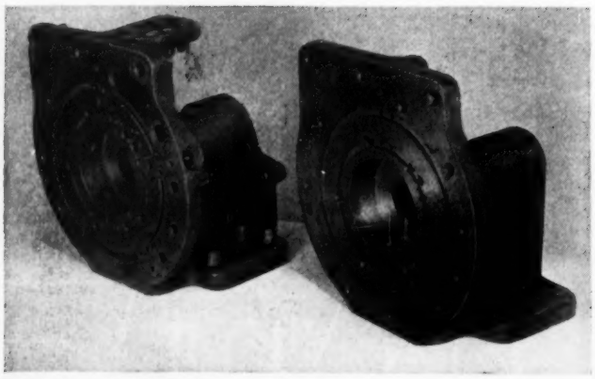


Fig. 5. The Master Templet Shown at Left is Used in Setting up Tools for Drilling Pump Body at Right

the plant of the Cincinnati Milling Machine Co., as applied to relatively small lots.

Now, carrying the multiple-spindle drilling idea farther, we have the multi-spindle machine on which more than one hole is drilled at a time. For some years, a multiple-spindle drilling head attached to a single-spindle machine has been in use for drilling special parts. This was a special tool adapted to only one part and was not flexible in any way; that is, it was necessary to have a special head for every part on which such a tool could be used, provided, of course, it could save enough to pay for the length of time it was idle.

The multi-spindle machine adaptable to any job is, no doubt, the outgrowth of this old multiple-spindle head. These machines are built with varying numbers of spindles. The spindles are so arranged that they can be adjusted to nearly any conceivable position and to very close center distances. On any one machine, the spindles can be arranged with various combinations of drills in one set, reamers in another, and taps in another. By using a tumble jig, all holes in a single piece can be drilled, reamed, and tapped in multiples on this one machine.

Track System for Drill Jigs

If there are too many holes and if the work is too complicated to be handled readily on one machine, several machines can be arranged in a row and a track laid across the tables for the full length of the combination of machines. In this case, the jig is mounted on wheels and moved from one machine to the next until the finished piece is taken out at the end of the line. Some of these single and combination jobs will now be described.

The first is a combination job for the drilling of booster pump bodies. Here, four multiple-spindle drilling machines are used in combination with a tumble jig mounted on a movable carriage. The entire combination is shown in Fig. 4.

The carriage carrying the jig is moved to its predetermined position in the first of the multiple-spindle drilling machines and seven holes are drilled. The carriage is then moved to the following machines, at each of which a number of holes are drilled. All in all, some fifty-seven holes of varying diameters are drilled, reamed, tapped, etc., on these multiple-spindle machines. These holes are all held to very close limits. It is necessary to have a master body, which is used as a templet in setting up the job. The holes in the master are lined with steel bushings to prevent any error due to wear. This master is shown at the left in Fig. 5, and the body itself at the right.

Since it would be practically impossible for the operator to remember which drills are used in each machine and the positions at which the spindle arms have to be located to get the proper center distances, charts are made up which show the position of the locating arms of the spindles and the distance of the spindle from the outer edge of the spindle-carrier head.

In the second of the multi-hole drilling jobs, the part is mounted on a revolving carriage, so that it can be rotated into position under fixed templets. In this particular installation, the carriage has three stations, at the first of which drilling is done and at the second spot-facing, the third being used as a loading station. Thus, as the second operation is being done on one piece and the first operation on another, the operator unloads the finished piece and replaces it with an undrilled part. Since the

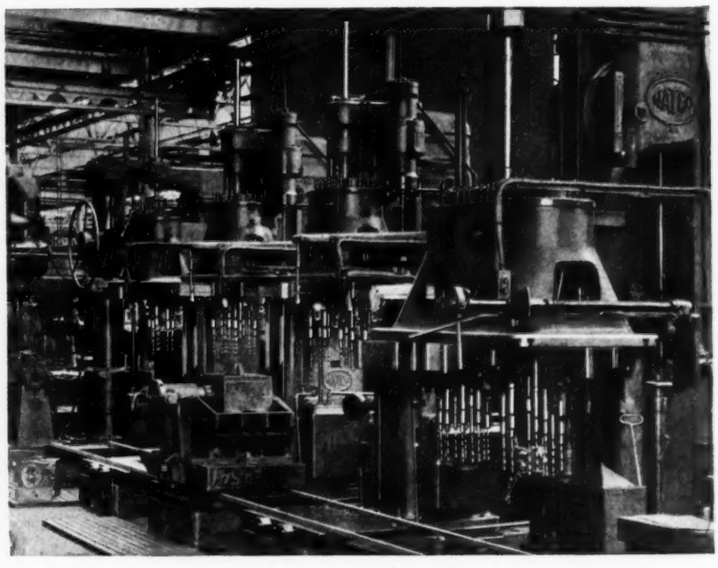
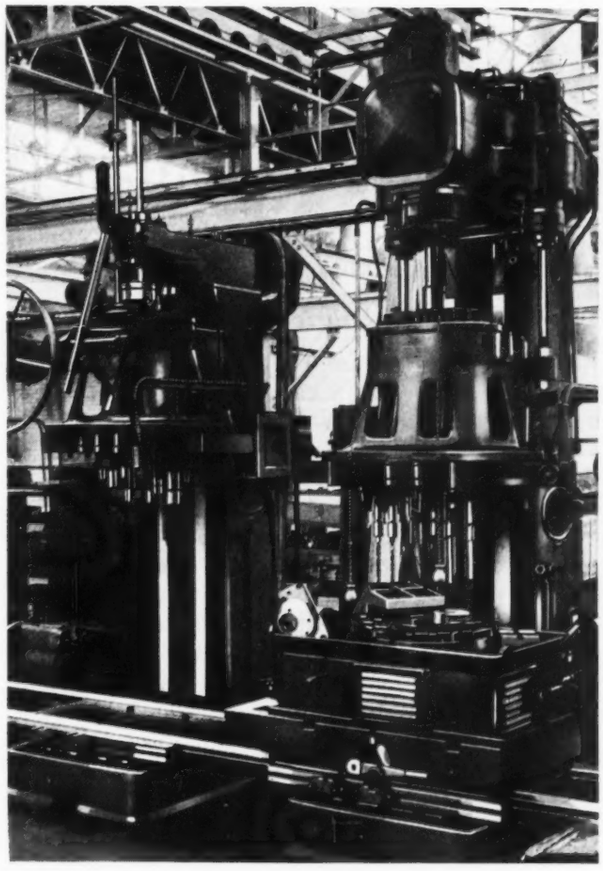


Fig. 4. Four Multiple-spindle Drilling Machines Set up for Drilling Casting Shown in Lower Left-hand Corner

machine proper is fully automatic, the operation is continuous, the carriage being revolved by hand from one station to the next. This set-up is shown in Fig. 6, along with the finished part. In this case also, the time for drilling eight holes and spot-facing four holes complete is considerably less than with the single-spindle method.

Another application is illustrated in Fig. 7, which shows two machines with a revolving jig mounted on a traveling carriage. A portion of the job is done in the right-hand machine and the jig is then moved to the left-hand machine for finishing the work. There are thirty-two tools in the complete set-up.

Fig. 6. Multiple-spindle Drilling Machine Set-up, Showing Finished Piece Held in Indexing Jig



The set-up is accomplished in much the same manner as in the case shown in Fig. 4. Since the set-up time is relatively high, care has been taken to give the operator every assistance to make it as fast and fool-proof as possible by giving him spindle positioning charts and gage plates for setting drills, counterbores, reamers, etc., to the proper height. However, the set-up time is comparatively unimportant in view of the total saving in time effected, as indicated by the following example:

In the case of the booster pump, there are some fifty-seven holes in the casting. The same job on a single-spindle machine would require considerably more time. Comparing the time required by the two methods, we find that we can break even with a quantity of approximately ten pieces in a lot and, on as small a quantity as twenty-five, we are able to save several hours.

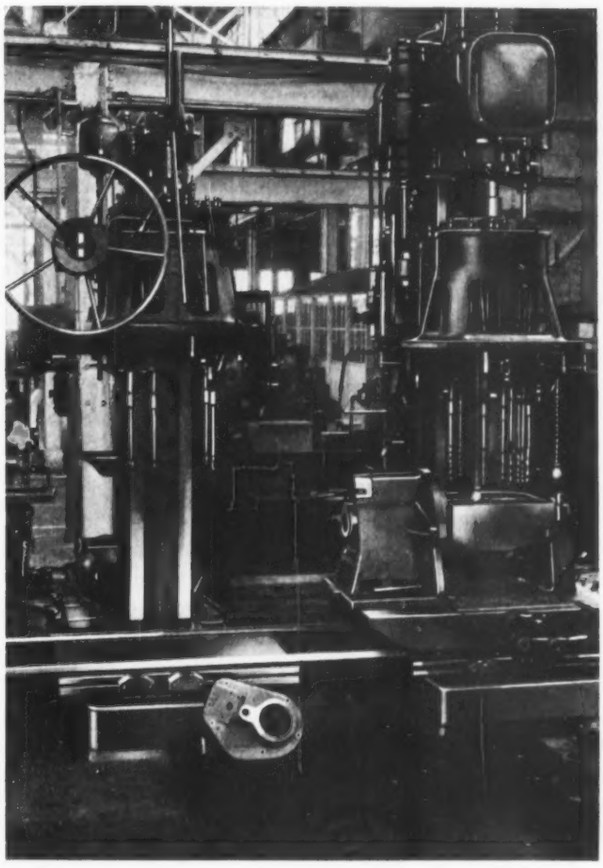


Fig. 7. Two Multiple-spindle Drilling Machines Set up in Combination for Machining Part Shown

Packaging Machinery Manufacturers Institute Elects Officers

At the second annual meeting of the Packaging Machinery Manufacturers Institute, Inc., with headquarters at 342 Madison Ave., New York City, the following officers were elected: President, H. H. Leonard, vice-president and general manager of the Consolidated Packaging Machinery Corporation, Buffalo, N. Y.; vice-presidents, H. Kirke Becker, vice-president and general manager of the Peters Machinery Co., Chicago, Ill., and Roger L. Putnam, president of the Package Machinery Co., Springfield, Mass. Helen L. Stratton, 342 Madison Ave., New York City, was elected secretary and treasurer of the Institute.

Selecting Carburizing Boxes

BOTH the quality and the cost of casehardened surfaces are influenced to a large extent by the size, shape and material of the carburizing box. The choice of boxes is limited in many cases by the type of furnace and fuel available. However, the large variety of carburizing boxes now in use is somewhat confusing.

The relative values of the various types of equipment and methods employed by British manufacturers for carburizing operations were investigated recently by an engineer in that country. Some of the points brought out by this investigation are given here. They pertain to such factors as the importance of light-weight pots or boxes and their shapes; fabricated steel boxes versus cast boxes; and the detrimental effect of sulphur gases.

Longer Life Versus Heating Costs

Cast boxes are, of course, heavier than boxes fabricated from rolled material. Except in the smallest sizes, the minimum limit of wall thickness for cast boxes is 3/8 inch, and many are cast 7/16 and 1/2 inch thick. The selection of boxes is often erroneously based on the estimated length of life or the cost per thousand hours of operation without taking into account the heat absorbed in bringing the box up to the carburizing temperature each time it is used. Thus, while the thicker and heavier box may have a longer life per unit cost than a lighter box, the greater amount of heat absorbed in bringing it up to the required temperature may offset the advantages of longer life.

For example, two boxes of different thicknesses were under consideration for a specific job, the lighter box weighing half as much as the heavier one. The heavier box cost twice as much as the lighter one; but as the salesman correctly pointed out, the life of the heavier box would be nearly three times that of the lighter box, and, therefore, the ultimate cost would be less. This is true until the question of fuel consumption is taken into account, when the conditions become reversed.

Obviously, to make a fair comparison of costs between a light- and a heavy-weight box, it is necessary to consider the difference in weight between the two boxes, the cost of the material, the number of times the box must be brought up to operating temperature during its life, and the amount of heat required for accomplishing this.

When boxes of large cross-sectional area are packed with large numbers of small parts, the work near the sides and the corners is brought up to carburizing temperature quicker and thus receives a deeper case. In some types of fuel-fired furnaces, the use of large boxes accentuates the tendency for the sides and corners to become overheated.

Probably the ideal carburizing container, as regards even penetration of heat, is the tube. Tubes can be laid horizontally in the furnace; and if multiple rows are used, it will be found that the second layer laid at right angles to the first generally gives better results than box-shaped containers. Although tubes are not practicable for many classes of work, they are applicable to a larger proportion of carburized parts than is generally realized. Camshafts, transmission gears up to 8 inches in diameter, worm-shafts, differential gears, shafts and similar work can best be carburized in tubes. The tube also has advantages from the metallurgical and fabrication viewpoints.

Next to the tube in desirability as regards shape is the circular box of a diameter greater than or equal to its height. Such parts as crown wheels, large flat gears, and similar parts are best carburized in boxes of this type.

Comparison of Fabricated and Cast Boxes

In order to determine the most suitable material and construction for a carburizing box 13 inches in diameter by 13 inches deep, tests were conducted over a period of twelve months. A cast nickel-chromium alloy box with 3/8-inch walls weighed, with the lid, 95 pounds. A welded box made from 1/4-inch plate weighed 58 pounds. The cost of the welded box was approximately three-fourths that of the cast box. These boxes were tested in electric carburizing furnaces. In addition to saving electric current, the welded box had the advantage of lower initial cost and of being easier to handle. As a matter of fact, the last lot of welded boxes of this size were made of 3/16-inch material, which, after 1450 hours' service, gives every indication of having a satisfactory life.

Probably the best known of the heat-resisting alloys are those containing upward of 60 per cent nickel with from 15 to 25 per cent of chromium. The 25 per cent nickel, 20 per cent chromium alloy has given very good service in rolled material.

Detrimental Effect of Sulphur Gases

Probably the worst enemy of the alloy materials used for carburizing boxes is sulphur gas, which may be present in a coke- or coal-fired furnace or in a furnace fired with only partially washed producer gas or fuel oil. Dangerous sulphurous gases may be evolved from certain types of carburizing materials, particularly those containing charred leather, petroleum coke, or ordinary coke. If the ordinary nickel-chromium heat-resisting alloys are to be operated at their fullest economy, the furnace gases must be kept free from sulphur compounds, particularly sulphur dioxide.

Die Designed to Make Right-Angle Bends at Ends of Formed Part

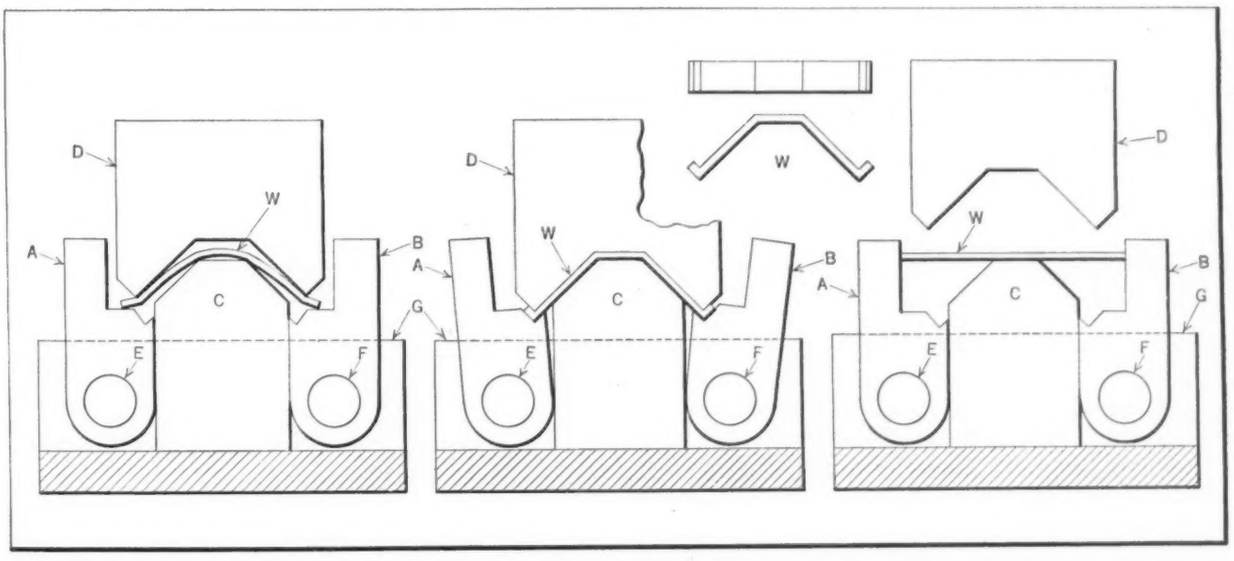
By L. KASPER, Philadelphia, Pa.

The accompanying illustration shows the construction of a die for forming the piece shown at *W* in one operation. Although this piece is not of intricate shape, it nevertheless presented an unusual forming problem because of the short length of the turned over ends, which are drawn together in forming the two inner bends.

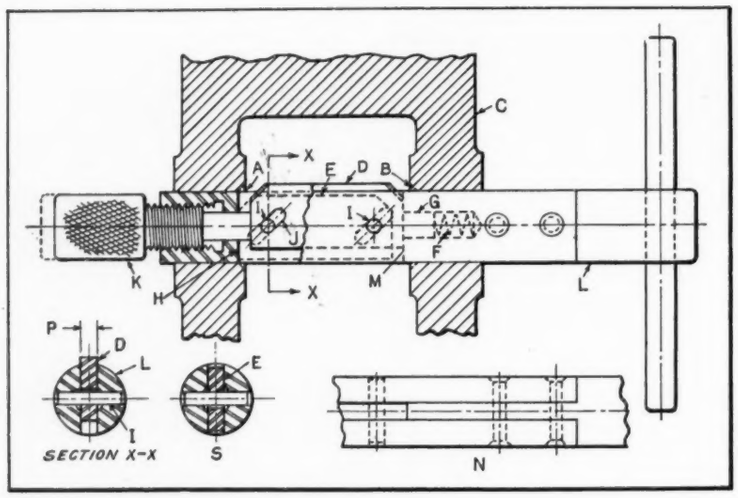
The central view shows the forming die and work at the completion of the operation, with the ram of the punch press in its lowest position. With the ram in this position, the working surfaces of the die conform to the shape of the work *W*, giving it the final set. It will be noted that the sections *A* and *B* are swung outward, away from the block *C* over which the two inner bends are formed. The reason for this movement of sections *A* and *B* will become apparent by referring to the view to the extreme left.

In the latter view, the ram is shown nearing the bottom of its stroke. In this position, the work *W* has been rough-formed around the section *C* by the action of section *D* until the ends of the work have struck the horizontal surfaces of sections *A* and *B*, starting the short bends on the ends of the work *W*, as shown. Had the work been formed into this shape with the sections *A* and *B* in the positions shown in the central view, which would be the condition encountered had the lower die been made in one section, it is apparent that the ends of the work would slide off the corners of the V-grooves in sections *A* and *B*, thus failing to take the required bend.

Sections *A* and *B* are carried in the grooved



Three Views of Die Designed to Form the Part Shown at W



Hand-operated Tool for Chamfering Inner Ends of Line-reamed Holes at A and B

holder *G*, and are free to swing on pins *E* and *F*, being normally held against the block *C* by a spring (not shown). As the ram descends farther, the points on section *D* start the bends on the ends of the work *W*. By virtue of the wedging action of the work in the V-grooves in sections *A* and *B*, the latter are caused to swing outward, automatically centralizing themselves in relation to the points on section *D* until they are in position for the final setting, as shown in the central view. The view at the right shows the unformed piece *W* supported on section *C* and located between members *A* and *B*, ready for the forming operation.

Chamfering Tool for Inaccessible Work

The edges *A* and *B* of the line-reamed holes in casting *C* shown in the accompanying illustration are inaccessible to the type of scraper or tool ordinarily used for chamfering or breaking sharp corners. No difficulty is experienced in chamfering these corners, however, with the special hand-operated tool shown. The work is held in a vise and the tool is inserted into the holes with cutter *D* in the position indicated by the dotted lines at *E* and by the cross-section view at *S*.

Spring *F* and plunger *G*, in conjunction with pins *I* and slots *J*, serve to hold the cutter in position *E*, with one end in contact with surface *H*. When the cutter is located between the faces of the bosses, the knurled feed-screw *K* is held lightly against rotation and bar *L* is turned clockwise several revolutions until cutter *D* is fed into the working position shown, through the action of pins *I* in slots *J*. At this point, the end of cutter *D* strikes surface *M* and screw *K* slips in the operator's fingers.

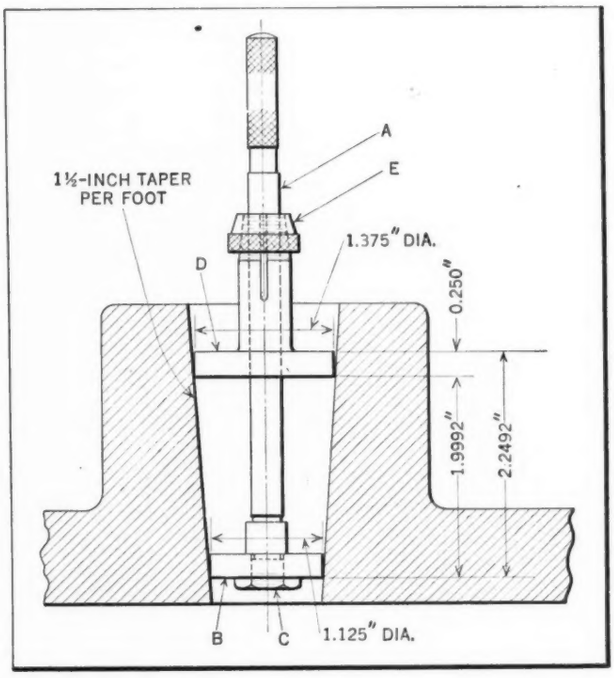
Continued rotation of the tool with an axial movement results in chamfering the edges *A* and *B*. When the operation is completed, screw *K* is again held stationary and bar *L* turned counter-clockwise until spring *F* has returned cutter *D* to position *E*, after which the tool is withdrawn from the holes. The two-piece construction of bar *L*, shown at *N*, simplifies the machining of the cutter slot to the width *P*. R. P.

Gage for Inspecting Taper Holes

By C. W. PUTNAM, Athol, Mass.

The gage shown in the accompanying illustration was designed for use in the inspection of taper holes. It is shown in position for testing a hole bored and reamed to a taper of 1 1/2 inches per foot. The central spindle *A* is hardened and ground. Disk *B* is held in position by the hexagonal nut *C*. The sliding or adjustable disk *D* is provided with a split shank and a threaded nut *E* for clamping disk *D* on spindle *A* after the two disks are in contact with the hole, as shown. The disks *B* and *D* are hardened and ground.

After the gage is located in the hole as shown, it is removed from the casting and a three-inch micrometer is used to measure over the two disks. Deducting the thickness of the top disk from the reading, the remaining figures for the hole dimensioned as shown should be 1.9992 inches. This is the correct distance from the bottom of the top disk to the bottom of the lower disk. Should the distance



Method of Using Special Gage for Inspecting Taper in Bored Hole

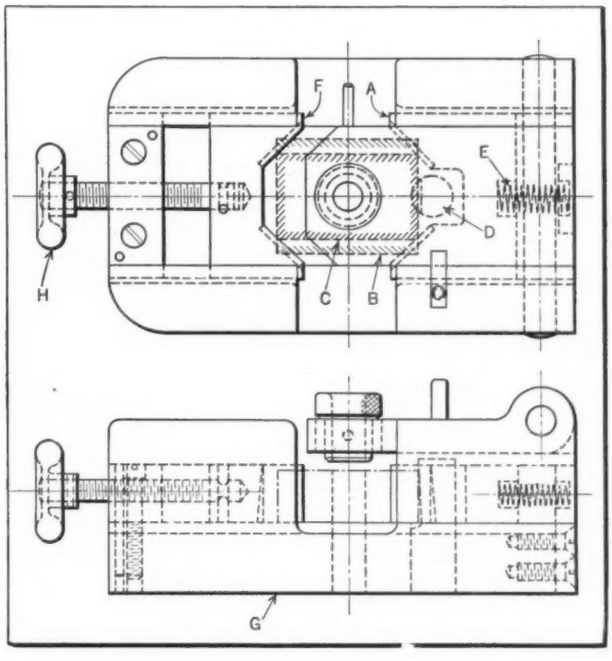
measured be other than 1.9992 inches, the inspector knows that the taper is not 1 1/2 inches per foot as required, and consequently rejects the work. Rules for calculating the taper per foot are found on page 1028 of the Ninth Edition of MACHINERY'S HANDBOOK.

Jig with Floating V-Block for Centering Work

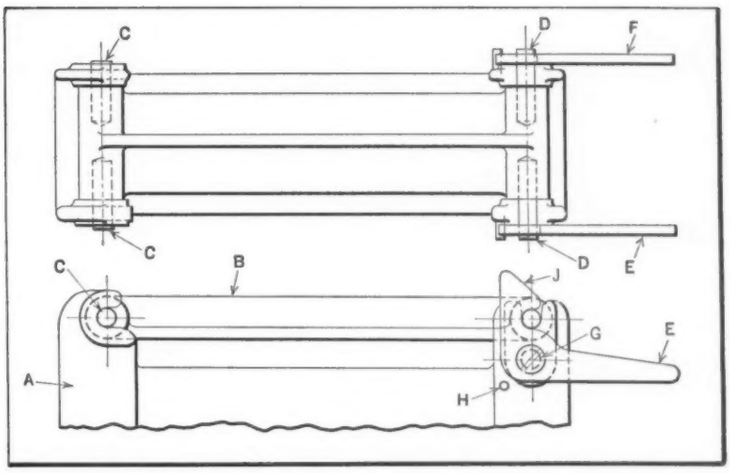
By PHIL E. VERAA, Richmond Hill, L. I.

The jig here illustrated was designed for use in drilling and reaming a hole in the center of either one of two blocks. These blocks are of different widths, as indicated by the dotted cross-sections *B* and *C*. The jig is required to center either block under the drill bushing when the clamping screw *H* is tightened. To accomplish this, a sliding V-block *A* is provided, which acts as a self-centering guide while the V-block *F* is being advanced to clamp the work. The V-blocks *A* and *F* are sliding fits in base *G*.

In operation, V-block *F* is moved back and the work placed in position in front of the sliding V-block *A*, which is held firmly against pin *D* by the action of spring *E*. Block *F* is then advanced, causing block *A* to recede and the work to be clamped against the flat surface on pin *D*. The contact surface of pin *D* and the clamping and locating surfaces of the V-blocks are made tapering, so that a downward clamping action is obtained.



Jig Used in Drilling Hole in Center of Blocks of Different Widths



Removable Cover for Jig with Quick-acting Clamping Latches

Removable Jig Cover for Drill Bushings

Simplicity of design is a feature of the large jig plate cover *B* shown in the accompanying illustration. This cover is of the removable type, and is used with the base *A* of the jig, which carries the work. The cover *B* contains a number of drill guide bushings and is held in place by latches *E* and *F* at the sides of the jig. Stop-pins *H* serve to limit the swinging movement of the latches on studs *G*.

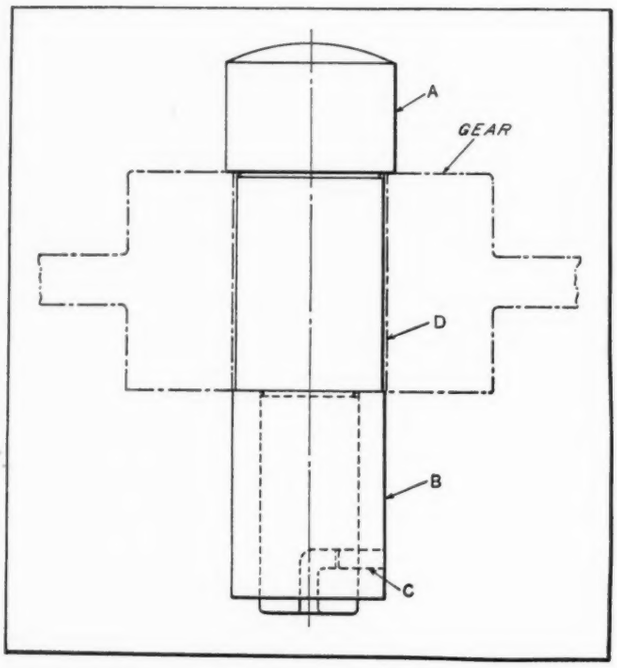
In putting the cover in place, pins *C* are slipped into position under the hook-shaped lugs on the left-hand end of base *A*, while pins *D* are lowered into the slots as shown. As pins *D* ride over the beveled surfaces *J* of the latches, the latches are swung up and over the pins *D* into the proper position for holding the cover down in place. The long end of the latches is made heavier than the latching end, so that the latches have a tendency to hold the cover down. H. M.

Pilot for Pressing in Thin-Walled Bushings

By J. E. FENNO, Belleville, N. J.

At the present time, thin-walled bronze bushings are being used to a large extent in gears that are required to rotate on their shafts. If these bushings are not started into the gear bore squarely, they are quite likely to become distorted. As a result, the bushing hole must be remachined in place to make it run true with the gear. In one plant, the inexpensive pilot shown in the accompanying illustration is used to assure a straight start in assembling thin-walled bushings in an arbor press. It consists merely of the plug *A*, retaining bushing *B*, and lock-pin *C*.

To assemble the bushing indicated at *D*, the bushing is slipped over the plug to the position shown and is retained on this plug by bushing *B*. Bushing *B* is locked by pin *C* which engages a



Pilot Used in Pressing Thin-walled Bushing into Bore of Gear Hub

bayonet slot in the plug. The outside diameter of bushing *B* must be slightly smaller than the diameter of the gear bore to serve as a pilot for starting the bushing squarely. After the bushing has been started, it is pressed into place and bushing *B* and plug *A* are removed.

In making this tool, the diameter of the part of plug *A* that enters the bronze bushing should be less than the diameter of the bore in the bronze bushing by an amount equal to the allowance made for the press fit. Otherwise, difficulty will be experienced in removing the plug after the assembling operation.

Indexing Fixture of Electrically Welded Construction

By O. S. MARSHALL, Pasadena, Calif.

The indexing fixture shown in the illustration is adapted for use on a lathe, milling machine, or shaper. Certain types of work ordinarily handled on a milling machine can frequently be machined more readily on a lathe equipped as shown.

The fixture is fabricated from 10-inch channel iron, electrically welded. The back, which rests against the lathe faceplate, is reinforced by two bars of 1/2- by 1 1/2-inch steel, also electrically welded to the channel iron. The base for the index-plate is electrically welded to its seat. After a finishing cut had been taken across the two parallel strips that rest against the faceplate, the circular baseplate was faced and bored on an engine lathe, being held against an angle-iron for this operation.

The index-plate is 9 inches in diameter and 1 inch thick, with a hub 2 inches in diameter. The hub has a 1 1/4-inch hole through the center for the indexing spindle and a nut and washer beneath to retain the assembly. Only four indexing slots are provided on the plate shown. A hardened parallel locking bar was made to fit these slots. The indexing capacity of the plate can be easily increased by cutting worm-gear teeth on the rim of the index-plate. A worm and small index-plate can then be employed for indexing.

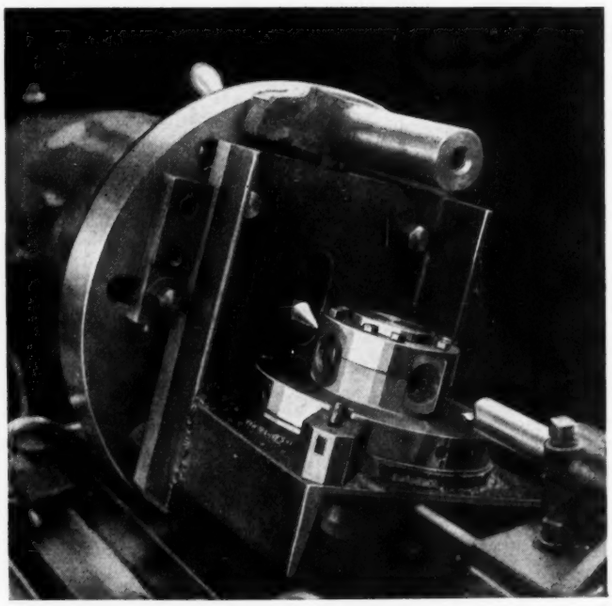
In locating the fixture on the faceplate of an engine lathe, a straight bar is placed between the lathe centers for reference. The correct height setting is readily obtained by inserting a gage of the required thickness between the reference bar and the index-plate. For centering the fixture, another reference bar is placed in the index-plate hole.

A series of holes is drilled in the face that rests against the faceplate to provide liberal movement of the fixture to suit a variety of work.

* * *

National Automobile Chamber of Commerce Changes its Name

According to an announcement made by Alfred Reeeves, vice-president of the National Automobile Chamber of Commerce, the name of this organization has been changed to the Automobile Manufacturers' Association. The change was made because it was believed that the new name would be more indicative of the composition and functions of the organization, and would prevent confusion with other organizations. The headquarters of the Association are at 366 Madison Ave., New York.



Indexing Fixture Constructed of Turned Parts and Channel Iron, Assembled by Electric Welding

Greater Tool Life by Efficient Lubrication

In many machining operations, the life of tools is prolonged and production increased by making special provision for cooling in the design of tools or fixtures, or by providing extra channels or nozzles through which the cooling medium can be more easily directed to the required points.

A requisite of great importance is a high-pressure pump. Sufficient force must be used to force the chips outward along the flutes of a drill. In many cases oil drills are used with so little pressure that the chips pack solidly in the flutes, causing back pressure enough to stop the flow of cutting coolant.

The method of leading the coolant to the tool depends upon circumstances. In a turret lathe, it can be pumped to a distributing collar at the center of the turret and piped from there to the tool; or a system of telescoping tubes can be led through from the rear end of the spindle, the forward end of one tube entering a hole in the end of the bar.

Proper cooling of a reamer sometimes makes all the difference between a smooth hole and one that shows tooth marks.

In the heavy milling of steel or bronze, an ample supply of coolant is essential. Modern milling machines are usually well provided with adjustable nozzles through which the coolant can be directed to the points required.

Different materials cannot be machined to the best advantage with the same coolant. A coolant suited to comparatively slow speeds with a moderate chip may be found inadequate when used for heavy cutting with higher speeds. The effect of the fluid on the bearings and ways of a machine is a factor to be considered. The cooling properties may be excellent, but the possibility of injury to a bearing surface may prevent it from being used.

Occasionally, the management fails to realize that a coolant "wears out" and loses its efficiency with continued use, even if reclaimed by passing through a separator. An old coolant that has been passed through a separator has not the efficiency of fresh oil, but a part of the old oil can be rectified with a few gallons of fresh coolant and used with economy.

In cutting any material the characteristics of which are unknown, keep in mind that your problem is to cool the tool and the chip. Keep the work at a minimum temperature, and cool the tool so that it will cut more easily. Select the coolant with these points in mind, using good materials made by reputable firms and mixing your solutions with care. Then tool life will be lengthened, and the majority of your metal-cutting troubles will disappear.—*The Houghton Line*

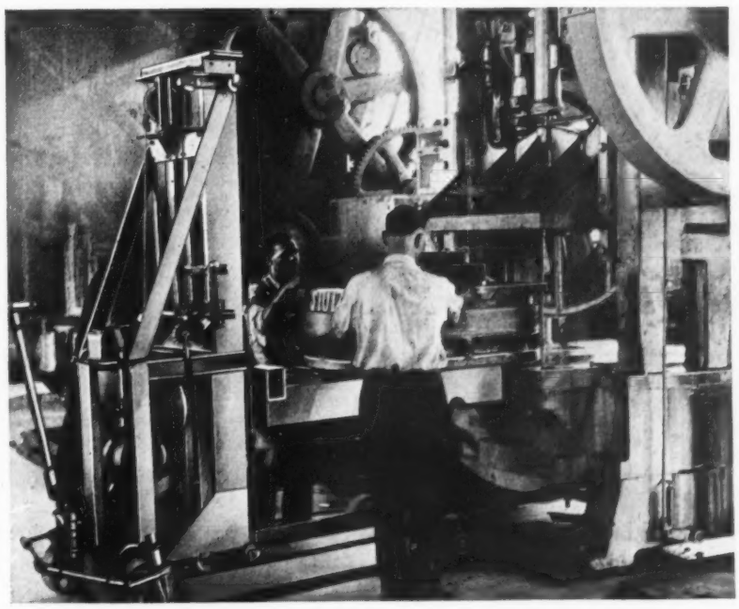
* * *

Handling Heavy Dies with a Mechanical Stacker

By FRANCIS A. WESTBROOK

The illustration shows how a stacker of 1500 pounds capacity is used in the shop of the A. C. Klopping Co., Toledo, Ohio, for placing heavy dies on a punch press. Many of the dies used in this shop weigh as much as 1500 pounds. Formerly, five or six men were required for the hazardous job of lifting the dies on and off the punch press bed. With the aid of the stacker, two men can now handle the heavy dies with ease and safety.

The stacker shown has been especially adapted for this service by making it only 24 inches wide. This narrow width permits the stacker to be pushed in between the legs of the press and thus avoid leaving a gap to be bridged between the stacker table and the press bed.



Two Men Using Mechanical Stacker as Shown Can Safely Handle Heavy Dies Ordinarily Requiring the Services of Six Men

* * *

A case of reconditioning the teeth in a large gear by bronze-welding is quoted by the Linde Air Products Co. A gear three feet in diameter with forty-five teeth was badly worn. A number of the teeth were chipped and all showed signs of wear. These teeth were rebuilt and refinished for less than $50, while the cost of a new gear would have been about $600.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

E. R. B.—I have been informed that dry ice has been used successfully for hardening steel? Is this being done commercially?

A.—Research work conducted in the metallurgical laboratories of the Carpenter Steel Co., Reading, Pa., has shown that certain steel alloys can be hardened appreciably by cooling them to low temperatures with dry ice. The tests were made mainly on chromium-nickel, nickel-silicon, and other corrosion-resisting steels. Not only were the alloys hardened without discoloration, but unusual physical and corrosion-resisting properties were developed. The machineability of the metals was also improved in some cases.

Patent Applied for Under an Assumed Name

A. B. J.—Mr. Blank, a citizen of a foreign country, applied for and was granted a patent in the United States, using an assumed name, which he had adopted himself without having it changed by usual procedure either in the country he came from or in this country. He has since become naturalized under the assumed name. Brown and Black were each assigned a one-third interest in the patent, as they had financed its development. Is the patent void on account of the fact that Blank used an assumed name in obtaining it?

Answered by Leo T. Parker, Attorney-at-Law
Cincinnati, Ohio

On page 8, Section 24, of the Rules of Practice of the United States Patent Office is found the following: "A patent may be obtained by any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, not known or used by others in this country before his invention or discovery thereof.

"In case of the death of the inventor, the application will be made by and the patent will issue to his executor or administrator. In that case the oath will be made by the executor or administrator.

"In case an inventor become insane, the application may be made by and the patent issued to his legally appointed guardian, conservator, or representative. The application and oath must be signed by the actual inventor, if alive, even if the patent is to issue to an assignee (see Rules 30, 40); if the inventor be dead, the application may be made by the executor or administrator."

Section 46 provides: "The applicant, if the inventor, must make oath or affirmation of what country he is a citizen and where he resides, and whether he is a sole or joint inventor of the invention claimed in his application."

Therefore, it is quite apparent that it is not necessary under all circumstances that the inventor himself make the oath in order that a patent shall be issued. Moreover, the rules do not specifically require that the oath shall be made in the name of the inventor.

Various courts have held that an assumed signature or mark does not invalidate the document where it is proved that the maker intended to be bound thereby. The fact that a person signs an assumed name does not relieve him from liability on a contract. For these reasons, it is my opinion that a patent would not be invalid if the application and oath were made by the actual inventor in the proper manner, under an assumed name.

Bearing Pressures

S. D. J.—Have the pressures on plain and sleeve bearings increased considerably during the last twenty years? I have in mind the general trend in designing practice rather than any given class of bearings. If much higher bearing pressures are allowed now, what factor or factors account for the increase?

A.—Information on this interesting question has been secured from prominent manufacturers of various classes of machinery. As plain or sleeve bearings differ greatly in regard to design, materials, workmanship, and lubrication, the following general statements about bearing practice are subject to numerous qualifications or exceptions.

The consensus of opinion is that unit pressures have increased, say, within the last two decades, 50 to 100 per cent and more in many cases. There are several reasons, of course, why such increases have been justified. In general, they embrace improved bearing design, superior workmanship, and developments in bearing materials. The manufacturers responding to our questionnaire regarded improved bearing materials, improved design and workmanship, and better lubrication application as the most important contributing factors, but not necessarily in the order named, as opinion was about equally divided as to the relative values of these three factors.

Improvements in bearing design appear to be chiefly due to knowledge obtained through service tests and laboratory research aimed to establish the important factors. From the point of view of perfect film lubrication, maintaining a uniform film pressure throughout the normal pressure area is fundamental. To establish and maintain the proper film pressure area, requires the proper amount of clearance; symmetrical housing design to avoid distortion with temperature increase; smoothly finished bearing surfaces; and sufficient rigidity to prevent local metallic contacts that tend to break down the oil film.

Perfect film lubrication is difficult to maintain, especially under all conditions, so that the characteristics of bearing materials are very important. The developments in such materials have been due largely to the splendid work of the metallurgists and do not represent mere changes in composition, but improvements in the physical properties of the materials due to refinements in manufacture and the proper handling of bearing metals in connection with their application to shells or housings. Improvements in workmanship pertain not only to superior methods of finishing journal and bearing surfaces, but also to the proper application of oil-grooves and the chamfering of sharp edges of grooves or bearing sections.

Effect of Velocity upon Pressure

Is an increase in the allowable unit pressure warranted by an increase in velocity? There are differences of opinion on this point, doubtless due chiefly to different conditions. Assuming the maintenance of adequate film lubrication within certain limits, the pressure may be increased with the velocity. The aim is to use the maximum pressure and oil of the minimum viscosity consistent with service conditions, thus minimizing frictional losses. The use of relatively short rigid bearings having ground and possibly lapped surfaces is important in connection with high unit pressures. Generally speaking, it is easier to produce short precision bearings than long ones; moreover, the chances of trouble due to deflections are much less.

In designing bearings for maximum loads, the ZN/P factor appears to be a valuable guide. (Z = viscosity in centipoises; N = R.P.M.; and P = unit pressure.) This variable, which is assumed to be a function of the coefficient of friction, must, of course, be established for a given bearing and for the limiting combined values of maximum load and minimum velocity, and vice versa. When such a range of values has been established for a given bearing, similar bearings may be designed with reference to whatever ZN/P value provides a suitable factor of safety. By selecting a value as near to the value representing minimum friction as consistent with safety, it is possible to minimize bearing losses. This ZN/P factor has been applied in the design of turbine, generator, and other high-class bearings.

Many manufacturers use an empirical formula, such as PV = constant. Such a formula is used as a check or guide in designing bearings similar to the one upon which the constant is based. These constants, however, vary from at least 10,000 to 350,000, owing to tremendous differences in bearing design, workmanship, lubrication, and operating conditions. This extreme range of values illustrates why it has been impossible to deduce any general formula for bearing design. Such a formula would have to take into account at least eight variable factors, so that it would contain a lot of estimated values or guesses, and the final result would represent so much guessing that an empirical formula, especially if based upon a given class of bearing, kind of lubrication, and operating condition, would be more reliable.

Heat-Treatment of Cobalt High-Speed Steel

G. M.—I would like to obtain information on the heat-treatment of cobalt steel tools, especially for use in machining automobile crankshafts.

Answered by William C. Betz
Fafnir Bearing Co., New Britain, Conn.

Supplementing the answer to this question given in July MACHINERY, page 672, the writer would add that the best and only method of avoiding decarburization or scaling is to heat the parts for hardening in a salt bath. The parts should be heated slowly to 1650 degrees F. in a muffle furnace and then be transferred to the salt bath which is held at a temperature of 2350 to 2400 degrees F. Next they should be quenched in oil or in a salt bath at 1350 to 1400 degrees F. and cooled to the bath temperature, following which they should be cooled to from 300 to 350 degrees F. in oil. The drawing operation may be performed as described in July MACHINERY.

Use of the high-heat salt bath referred to here is known as the Bellis process. With this process, the work is as clean and smooth after heat-treatment as it was before it went into the fire. Tools with fine edges and shapes that cannot be ground after hardening can be finished to size in the soft machining state, and will not change appreciably through heat-treatment.

As oxygen and other decarburizing elements are kept from the steel while it is being heated, due to its immersion in the salts and the fact that a thin film of salt adheres to the work while it is being transferred to the quenching medium, no decarburization takes place.

On being quenched in oil, the salt film breaks up and if quenched in salt, the film dissolves in the lower temperature salt and the new salt film "blows off" in the subsequent oil quench, leaving the work clean and hard, without a soft outer skin.

Warping and Deformation of Welded-Steel Machinery Parts

A Discussion of the Stresses that Produce Warping in Welded-Steel Parts and an Outline of the Means Available for Overcoming the Difficulties

By W. T. DAVIDSON
Manager, Welding Division
Struthers-Wells Co., Warren, Pa.

WARPED welded-steel assemblies give quite as much trouble as warped castings. In either case, the part may not "clean up" in the machine shop or may be unsuitable for use because it will not fit other parts of the machine or equipment with which it is to be used. Basically, the cause of warping is the same in welded-steel assemblies as in castings—lack of uniform cooling. In the case of castings, this is usually due to different thicknesses of sections in different parts of the casting. In the case of welded-steel assemblies, the trouble arises from the fact that welding involves a localized application of heat, which means localized cooling. In the following, some details will be given regarding the causes of warping in welded steel, together with an explanation of some of the methods employed to meet the resulting difficulties.

In electric arc welding or gas welding, the weld metal itself is a cast metal after it has gone through the welding heat. In cooling, the cast weld metal shrinks the same amount that a casting would shrink in cooling from the molten to the ambient temperature, provided such shrinkage is not inhibited by the weld metal being fused to something more rigid than itself. Thus, a casting made in sand is free to shrink in over-all dimensions, and will do so according to certain rules with which designers and foundrymen are familiar. The amount of shrinkage is from 3/16 to 1/4 inch per foot, depending on the size and thickness. But the conditions surrounding a weld are quite different. The weld is used to join parts that may be many times as rigid as the weld itself, due to sheer bulk. These bulky parts have a stiffness that resists the contracting forces set up by the cooling weld metal. The weld would shrink at least 3/16 inch per foot if it were not prevented from doing so by the members to which it is fused. The difference between the amount the weld would shrink if it were free to move and the amount it actually shrinks, in spite of the resistance offered by the metal to which it is fused, is a fair indication of the residual stresses set up by the welding operation. The net deformation is called the amount of warping, and represents the state of equilibrium between the contraction force of the weld and the resistance of the structure.

The degree of warping in a given structure may not be readily predicted unless an identical one has previously been welded and the warping measured. Even under these conditions, accurate prediction would require that the second structure have the same degree of initial rolling stresses and that the amount and rate of application of the welding heat be identical. As will presently be brought out, a prediction of the amount of warping cannot be made within commercial limits in all cases, and it becomes necessary to correct the difficulty after it has occurred.

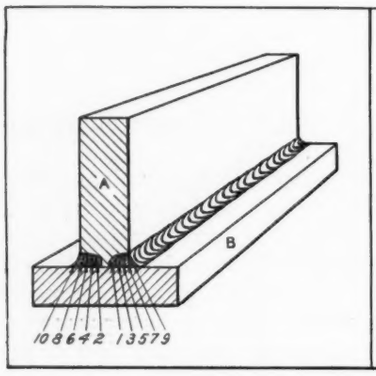


Fig. 1. Balancing the Sequence of Welds to Keep Member A at Right Angles to Member B

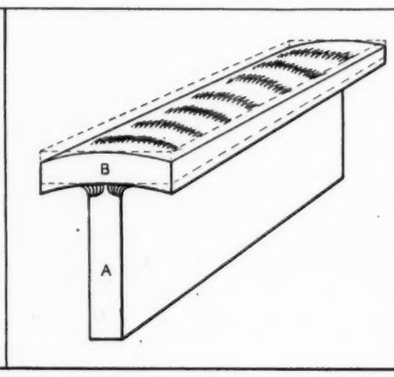


Fig. 2. Application of Welding Heat to Member B to Correct Warping Caused by Fillet Welds between A and B

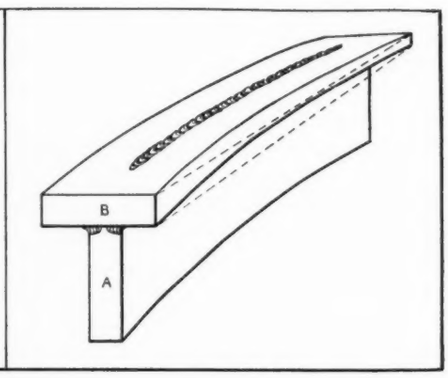


Fig. 3. Method of Applying Welding Heat to a Welded Member with a View to Correcting the Longitudinal Warping

In spite of the uncertainty as to the amount of warping in a given case, there is considerable certainty as to the direction of such movement. A weld always tends to get shorter and narrower. This is self-evident, since cooling metal always contracts and never expands. The last part of a weld to cool will contract the most; thus, a weld applied to the top surface of a steel plate lying on a table will cause the ends of the plate to curl upward. If identical welds are made on both sides of the plate, the contractional forces will balance each other.

The edges of two plates being progressively welded will tend to pull together as the weld advances. After they have come together tightly, continued contraction will cause buckling until the forces of contraction and the resistance to bending reach an equilibrium. These and other characteristics of behavior are simple of analysis; but it is with the methods used to overcome the difficulties that we are concerned in practical operations.

There are several methods of controlling warping within tolerable limits; there are also methods of correcting the difficulty when warping has taken place beyond the permissible limits.

Methods of Controlling Warping

The method of controlling warping that has probably been used longer than any other is to clamp or tack-weld the assembly to a relatively rigid frame during the welding operation. The theory is that by completely preventing movement of the assembly, the welds will develop stresses beyond the yield point, so that plastic deformation will take place. Since plastic deformation is permanent, when the assembly is cut loose from the rigid frame, it will retain its original dimensions. The method is not always successful, since the stresses in all parts of the assembly may not always pass the yield point, in which case, the deformation upon contraction is in the elastic range. Under these circumstances, the assembly will warp when it is cut loose from the rigid frame.

Peening each weld bead after it has cooled and before applying a subsequent bead or layer, in combination with step-back welding, is well recognized as a method that materially reduces warping. In some cases, instead of waiting for the weld bead to cool in a normal manner, water is applied to cool it quickly after temperature color has disappeared. Adoption of a welding sequence that distributes the welding heat in such a manner as to make the contraction forces of one weld pull in opposition to the contraction forces of another weld is valuable in minimizing warping. (See Fig. 1.)

There has been considerable controversy on the subject of peening welds to straighten warped assemblies. The fact is that a great deal of warping can be removed in this manner. The controversy revolves about the point of whether such peening damages the weld metal. The conservative position is that, within reasonable limits, such peening does not damage the weld metal, and when it has been damaged, the fact may be observed by visual inspection. The theory of the practice is based on producing, by the peening, plastic deformation of the weld metal, thus relieving the residual stresses that cause warping. The fact that some experimenters have not been able to remove all of the warping when following this method is, in most cases, because the weld introduces residual stresses in the parent metal, and the experimenter has failed to peen the parent metal adjacent to the weld. The difficulty may also be due to the fact that the original contraction produced plastic deformation.

Straightening Pieces that Have Warped

It is evident from the preceding discussion that warping cannot always be prevented. Hence, we must be prepared to straighten the piece if it has warped and cannot be corrected by peening. The simplest method of accomplishing this is to use a straightening press in the same way that a steel foundry uses a straightening press to straighten steel castings. However, there are cases in which a straightening press is not available, and other cases in which, due to the shape of the assembly, the press cannot be applied. Under such conditions, the assembly may be flame-cut, and jacks, in combination with holding down bolts, used to get the desired degree of straightness. The flame cuts are then welded so as to prevent a second warping.

Probably the most interesting method of straightening a warped member of an assembly, or the assembly as a whole, is by the application of welding beads (the carbon arc or the gas-welding torch may be used), with the sole purpose of producing counter-warping. (See Figs. 2 and 3.) The practice was developed by the shipyards, and its use is spreading, due to the fact that it is effective, costs little, and can be easily applied.

The situation with reference to warping in welded machine parts can be summarized by saying that in many cases warping can be controlled to permissible limits. When such control fails, the assembly can be straightened by well established methods.

Industry's Demand for Large Heavy-duty Anti-friction Bearings is Being Met by the Production of Such Bearings as the One Illustrated—a 1500-pound Self-aligning SKF Roller Bearing

MATERIALS OF INDUSTRY

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Why Nickel-Chromium Alloys are Used for Electrical Heating Elements

Resistance to oxidation and high electrical resistance are the chief requirements for metallic resistors used in electrical heating apparatus. If heating elements oxidize readily at the high temperatures to which they are subjected, their life is short. High electrical resistance is not so essential as high resistance to oxidation, but it is a very desirable property, as it enables the designer to use larger cross-sections in heating elements, with longer life as the result.

Nickel-chromium and nickel-chromium-iron alloys of proper proportions meet these requirements and were the first alloys that could properly be called satisfactory for heating elements, according to F. E. Bash of the Driver-Harris Co., Harrison, N. J. An interesting fact concerning these alloys is that, although they resist oxidation at high temperatures, the bare metal oxidizes readily. The reason for this apparent paradox is that the oxide, being very adherent and impermeable, protects the underlying metal from further oxidation.

Phosphor-Bronze and Nickel Silver with Free-Cutting Properties

Phosphor-bronze, a special bronze, and nickel silver having a lead content of from 1 to 4 per cent to increase the machineability are manufactured by the Riverside Metal Co., Riverside, N. J. The lead in these alloys permits the high-speed turning, threading, milling, etc., of a large variety of parts in automatic screw machines and similar types of equipment. The lead does not mix with the other alloyed materials, but remains in the form of minute particles which are distributed throughout the metal. In machining one of the leaded alloys, therefore, the cutting tool comes into contact with successive particles of lead. These break up the chip and act as a lubricant for the tool. In consequence, the tools are kept cool and free from chips.

These free-cutting alloys are available in the form of rods, wire, sheets, strip stock, bars, and blanks. The amount of lead in the phosphor-bronze varies from 1 to 4 per cent, whereas in the nickel silver, the lead content varies from 1 to 2 per cent. Parts made from phosphor-bronze are non-sparking, non-magnetic, and highly resistant to corrosion. The material has a high elastic limit, a high resistance to compression under heavy loads and a high resistance to wear. For these reasons, parts made from phosphor-bronze are suitable for operation under extreme pressures and for use in mine, paper-mill, marine, and similar applications.

Nickel silver possesses the advantage of retaining a silvery luster under scrubbing or polishing. It has a high tensile strength, is resistant to corrosion, and is non-magnetic. Nickel silver is widely used in making parts for watches, clocks, instruments of many types, small gears, optical goods, and a large variety of other manufactured products.

The special bronze referred to is composed of copper, tin, lead, zinc and phosphorus. This alloy does not have quite so high a tensile strength as phosphor-bronze, but its free-cutting qualities are superior.

Alloy Cast Iron Greatly Lengthens Life of Cylinders and Pistons

The Skinner Marine Unaflow type of steam engine is designed to operate at 300 pounds gage pressure and 200 degrees F. superheat, which means a total steam temperature of 622 degrees F. To meet the requirements at such high steam temperatures and to provide for the maximum life and minimum wear of the cylinders, pistons, and piston-rings, an alloy cast iron was developed of exceptionally close-grained structure, high tensile strength, and high Brinell hardness. As this metal has proved most successful under the steam conditions mentioned in heavy marine service, some data pertaining to the alloy cast iron used will prove of value.

In developing this metal, the Skinner Engine Co. was largely guided by the research staff of the International Nickel Co. The metal developed for the Skinner engines showed a Brinell hardness of from 230 to 240 in actual castings having sections 2 inches or more in thickness; and in a 5-inch diam-

eter sample bar, the Brinell hardness varied only 13 pounds from the center to within 1/4 inch of the rim. This uniform and high hardness was of great value in the cylinder walls for minimizing wear.

The tensile strength in 2-inch round test bars averages from 45,000 to 50,000 pounds per square inch, and in 3/4-inch round test bars from 60,000 to 65,000 pounds per square inch. Several castings were broken up to examine the metal structure, which was found to be uniformly fine-grained throughout, even at points where heavy and light sections joined.

Tests were also made for metal growth or structure change at high temperatures. It was found that no perceptible change or distortion took place after numerous applications of temperatures up to 850 degrees F.

The alloy cast iron used contains, in addition to nickel, small percentages of chromium and molybdenum, the latter aiding in dispersing the graphite into finely divided and distributed particles.

Engines with cylinders, pistons, and piston-rings of alloy cast iron installed on board ship have propelled the vessel to date over 57,000 miles at steam temperatures as high as 640 degrees F. They have averaged 15,000 horsepower-hours per gallon of cylinder oil, and have developed a perfect glaze on the cylinder walls; in addition, they have shown no perceptible distortion or wear of the valve seats.

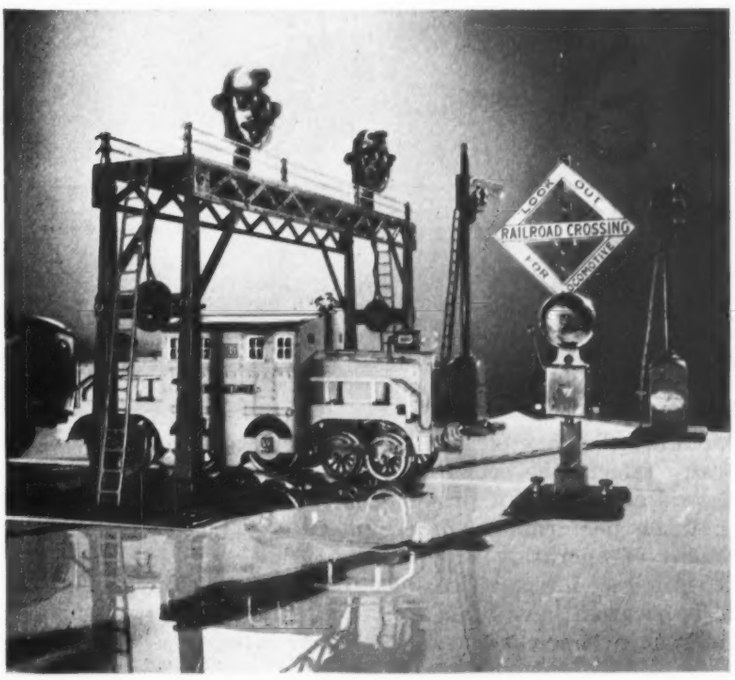
Copper-Silicon Product Specifications Approved by A.S.T.M.

The American Society for Testing Materials recently approved as tentative standards three specifications that cover copper-silicon alloy plates and sheets; sheet copper-silicon alloy; and copper-silicon alloy rods, bars and shapes. The three specifications have the same chemical composition requirements. This involves a silicon range of from 1 to 5 per cent and the following maximum percentages of other metals: Manganese, 1.50; zinc, 5; iron, 2.50; tin, 2; aluminum, 2; and the remainder copper.

In the case of shapes commonly used for drawing, forming, stamping, and bending, the minimum tensile strength requirement for soft material is 50,000 pounds per square inch with an elongation of 35 per cent in 2 inches. For half hard material, the corresponding figures are 70,000 pounds per square inch and 10 per cent in 2 inches; while for hard material, the minimum tensile strength is 80,000 pounds per square inch and the elongation 5 per cent in 2 inches.

The minimum tensile strength for plates and sheets that are to be used for pressure vessels is 55,000 pounds per square inch, the yield point is 22,500 pounds per square inch, and the minimum elongation is 40 per cent in 2 inches and 25 per cent in 8 inches.

There are varying requirements for copper-silicon and alloy bars, rods and shapes, depending upon the form of the material. The minimum tensile strength in the case of rods varies from 50,000 pounds per square inch for soft material in all sizes up to 90,000 pounds per square inch for hard material from 1/4 to 1 inch in diameter. The tensile strength for bars ranges from 50,000 to 65,000 pounds per square inch, while for shapes of soft temper and of all sizes, the minimum tensile strength is 50,000 pounds per square inch. For shapes of hard temper, the physical requirements are to be agreed upon by the manufacturer and the customer.



Santa Claus Now Relies on the Die-casting Process—Electric Railway Equipment Largely Made of Zinc Die-castings by the Dorfan Co., Newark, N. J.—Photograph Courtesy New Jersey Zinc Company

Centralized Lubrication of Industrial Machinery

By T. R. THOMAS, Chief Engineer
Bijur Lubricating Corporation, Long Island City, N. Y.

IN lubricating the bearings of machinery, the problem is mainly one of methods of application. There are lubricants for all conceivable requirements; the problems to be solved are how to apply the lubricant to the bearing surfaces, how to cover all points in moving contact on those surfaces, and how to keep the lubricant renewed uniformly and adequately, yet without waste.

"Point-by-point" lubricating methods have always been uncertain. The lubrication efficiency attainable under such conditions has never been very high, and varies widely with the conscientiousness of the operator. Most machines, if lubricated adequately under point-by-point methods, would keep the operator busy with the oil-can a considerable part of the day. As it is impracticable for an operator to spend as much time on this task as the best care of the machine requires, there is always more or less neglect, the degree depending on the attitude of the worker.

Yet the efficiency of lubrication of the machine directly affects the economical use of power, the rate and continuity of production, the dependability of the performance of the machine, and the economy of operation and maintenance.

Within recent years, various forms of centralized lubrication have been evolved to simplify and render more efficient the task of lubricating machines. In general, a central reservoir provides the supply of oil, which is conveyed to each bearing either through individual lines of tubing or through a single line of tubing that has branches extending to each of the different bearings.

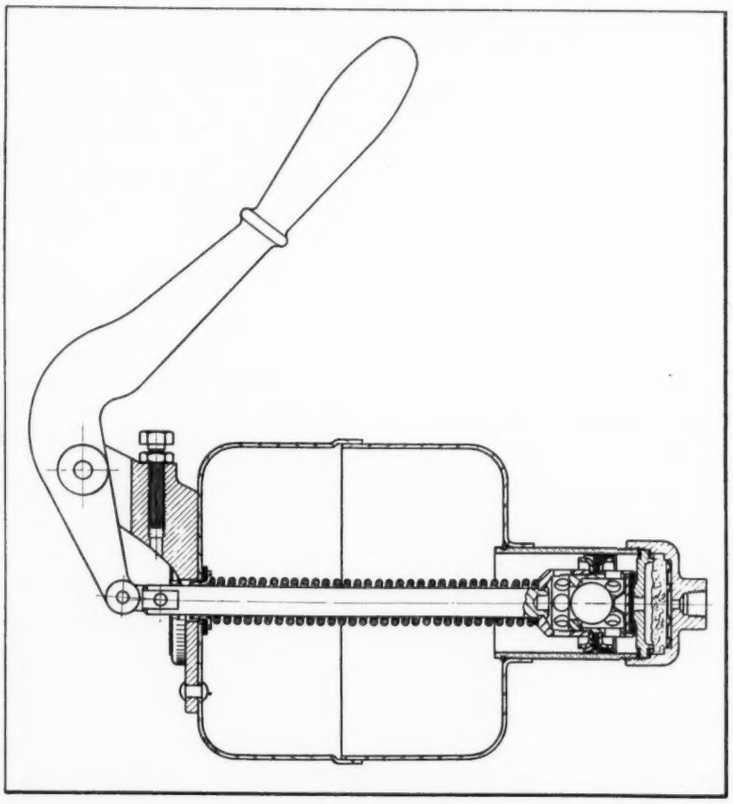


Fig. 1. Sectional View of the Bijur Manual Lubricator

Oil is pumped into the lines either manually by a single movement of a lever or handle, or automatically by mechanical drive from some revolving shaft or other part of the machine. In either case, all bearings in the central system are lubricated simultaneously. There is, therefore, a saving in time that is usually a considerable item in reducing costs; at the same time the lubrication is positive. There can be no overlooking of a bearing here and there because it is in a dark or inconvenient spot or because the operator is anxious to get through with the job in a hurry.

When a machinery manufacturer adopts central lubrication for the machines he builds, he designs correct lubrication into the very machine itself. It remains correct. The amount of lubricant delivered to each bearing is predetermined by the designer of the machine who should be, after all, the best judge of its requirements.

The adoption of central lubrication is also a distinct step forward in accident prevention. Point-by-point lubricating methods present serious hazards to the safety of workers. If it were practicable to lubricate a machine for a full day's work before or after plant operating hours, there

would be less danger; but bearings must be lubricated every time they need oil, and the intervals between oilings are usually much shorter than a working day. The risk to an operator in lubricating a machine during the working day is considered a necessary hazard of his job. Often he will neglect to shut down the machine while he lubricates bearings in dangerous locations, because he does not wish to interrupt production. Just a moment's carelessness under such conditions may cause a serious injury.

With central lubrication, the entire task of lubricating the machine is accomplished either automatically, without any attention on the part of the operator, or manually, by a single movement of a lever or handle at the operator's station. Thus he does not have to expose himself to the danger of accidental contact with any moving part of the machine.

Another hazard that is eliminated by central lubrication is the accumulation of pools of oil on the floor adjacent to the machine, due to excessive lubrication. Many an injury has been caused by workers slipping on an oily floor and falling into the machinery. Such pools are also a fire hazard.

It is interesting to note that in United States Government specifications for machinery, particularly machine tools, central lubrication is generally required. In private industry, too, many of the largest users of machines insist that new machines should be up to date as regards lubrication and equipped with central systems.

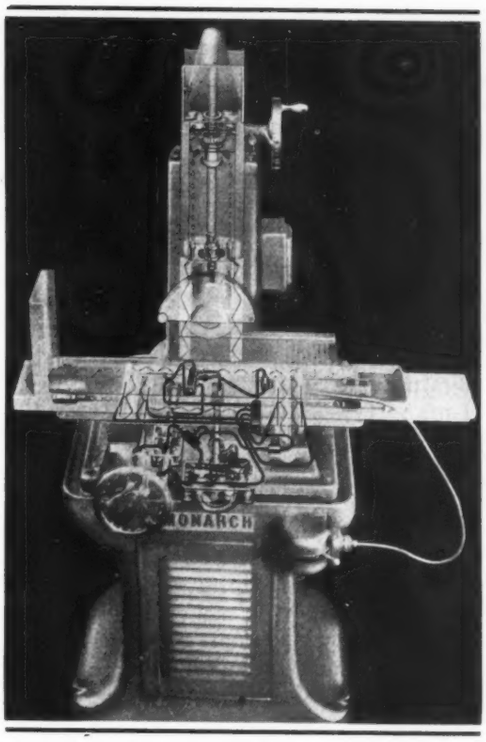


Fig. 2. Monarch Grinders Employ an Automatic Lubricator which Supplies Sixteen Bearings on the Moving Carriage with Lubricant at Each Traverse of the Wheel

The type of central lubricating system made by the company with which the writer is connected consists of a central reservoir, which may be either a self-contained unit or cast as part of the machine it lubricates; a pump; a single line of small-diameter metal tubing, with branches to the bearings to convey the oil; and a metering fitting or drip plug at each bearing. The pump may either be manually operated (often called "one-shot") or automatically operated from some moving part of the machine.

Manual lubricators are used when bearings require lubrication only once or twice daily. The pumps are operated by means of a spring which is easily compressed by a lever or handle. As this compressed spring is released, it gradually discharges a measured volume of oil into the system under high pressure. The oil is forced through a filter in the pump, thence through the tubing to drip plugs at each bearing. These drip plugs feed a predetermined amount of oil to each bearing.

When automatic lubrication is required, one of several types of automatic lubricators may be used. One such lubricator operates from a rotating shaft of the machine. It may be set to deliver a definite volume of oil at any interval from five minutes to five hours. In addition, a button is provided, by means of which oil may be fed to the

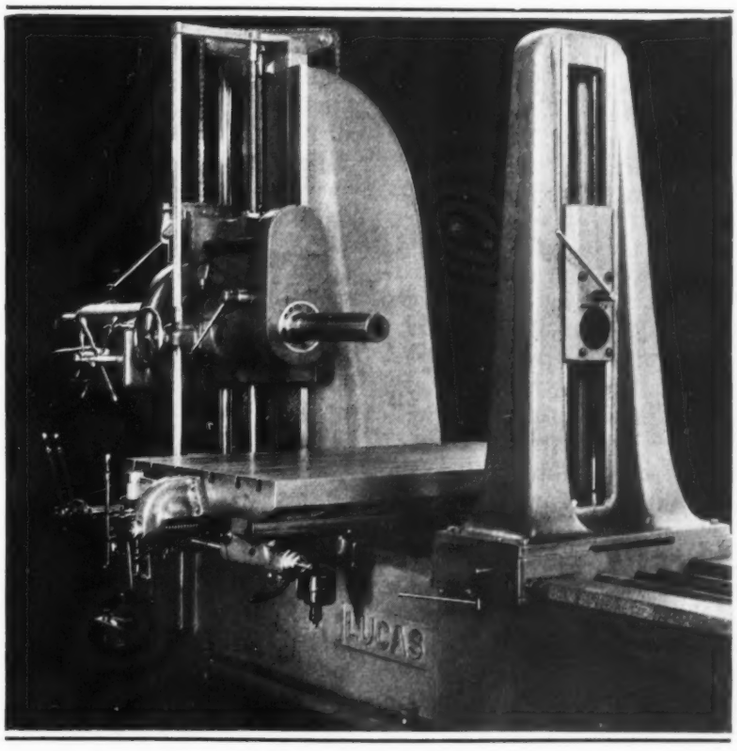


Fig. 3. By Depressing the Handle of the Lubricator Seen Beneath the Table to the Right, the Operator Lubricates Fourteen Bearings on a Lucas Boring Machine

bearings at any time, as, for example, in starting the machine at the beginning of a working day.

Another type of automatic lubricator is largely used in the lubrication of separate units of a machine, such as lathe aprons, boring machine heads, saddles, etc. This pump is very small and inexpensive and can be readily designed as part of a reservoir cast in the unit and connected to a system for the lubrication of the unit. The low cost of this lubricator allows the designer to provide lubrication of each such unit of the machine separately, thus obtaining automatic operation of each system only when the particular unit is in use.

Oil metering fittings or drip plugs used with the lubricators described are made in many types and flow rates to suit the requirements of any combination of bearings. Oil from the lubricator enters the drip plug through the filter. The actual control or metering is accomplished by means of a very accurate pin, floating in a carefully reamed hole. The clearance between the pin and the hole determines the flow rate of the drip plug. A valve in the outlet prevents air from entering the system, keeping the lines full of oil at all times, so that oil is delivered to the bearing immediately when the lubricator is operated.

With central lubrication of this kind, the amount of oil delivered to the bearing is predetermined according to the bearing requirements—its size, speed, load, etc. When the machine is idle, no oil is delivered to the bearing. This results in a considerable saving in lubricant. The uniformly correct lubrication assured by central systems effects substantial savings in maintenance costs. Undue wear is prevented. Often, too, this adequate lubrication results in a perceptible saving in power.

The tendency toward higher wages and shorter working hours in industry necessitates a careful scrutiny of costs to eliminate waste to as great an extent as possible. Central lubrication offers opportunities to make worthwhile savings.

* * *

International Acetylene Association Meets

The thirty-fifth annual convention of the International Acetylene Association was held at the William Penn Hotel, Pittsburgh, Pa., November 14 to 16. At this meeting a number of papers of particular interest to those engaged in gas welding and cutting were read. Among the subjects dealt with may be mentioned oxy-acetylene flame-cutting of wing-type billets; hard-surfacing in steel mills; the advantages of flame-cut surfaces for welding; a comparative study of cutting methods as applied to structural steel; welds for high tensile strength; production methods used in welding for construction purposes; pipe welding; dependability of commercial methods of testing welds; welding in the construction of vehicles; maintenance of railroad rolling stock; track welding; and safe practices in welding.

Reinecker Celebrates Seventy-Fifth Anniversary

One of the best known German machine tool firms, the J. E. Reinecker firm of Chemnitz, was founded seventy-five years ago. It was on October 1, 1859, that Julius Edward Reinecker, a pioneer in the Saxon metal industry, started a modest enterprise which ultimately developed into one of the leading German machine tool plants. At first he made mainly taps, drills, reamers, and similar cutting tools, but later engaged in the building of machine tools, first for his own use, and later for the market. Reinecker gear-cutting machines, milling machines, grinding machines, and lathes are well-known products. Reinecker was the only German machine tool builder that exhibited at the World's Fair in Chicago in 1893.

The founder of the business passed away in 1895, and it was carried on by his sons, two of whom have also passed away, while Julius Richard Reinecker is still in charge of the enterprise. The Reinecker plant occupies a floor-space area of 770,000 square feet, and employs normally close to 3000 men.

* * *

Adequate Lighting in Machine Shops

Referring further to the value of adequate lighting in shops and factories (see MACHINERY, September, 1934, page 64-A), a few additional examples have been called to our attention.

In a plant operating a battery of wire-drawing machines, a haphazard system of drop-cord lighting was replaced by a carefully planned overhead system. The output of the plant was increased 21 per cent without any other changes in equipment.

A manufacturer of automobile parts reports that after installing a new lighting system which more than doubled the lighting intensity, labor turnover dropped from over 6 per cent a month to less than 3 per cent a month. In addition, the output was increased sufficiently to pay for the installation in eighteen months.

The Westinghouse Electric & Mfg. Co. is making three definite recommendations for increasing the efficiency in machine shop operations: (1) Increase light intensities; (2) abolish glare; (3) provide uniform distribution of the light.

* * *

Exhibition of Inventions

To encourage inventors, a special exhibition of new inventions, which will be open to citizens of all nations, has been made a permanent feature of the Leipzig Trade Fair. The exhibition is especially intended for inventions that have not yet been applied industrially. Further information may be obtained from the Leipzig Trade Fair, Inc., 10 E. 40th St., New York City.

NEW TRADE LITERATURE

Recent Publications on Machine Shop Equipment, Unit Parts, and Materials. Copies can be Obtained by Writing Directly to the Manufacturer.

Molybdenum in Steel and Cast Iron

CLIMAX MOLYBDENUM CO., 295 Madison Ave., New York City, has brought out a new handbook on molybdenum, entitled "Molybdenum 1934," as a supplement to the book on this subject issued last year. The two books cover all the important and economical applications of molybdenum in steel up to the present time. The new book describes the molybdenum steels developed since the publication of the previous book, and in addition, gives information of value to the engineer and metallurgist in determining the proper steel to use for any particular application. Both books are still available to those interested in this subject. Separate publications deal with the use of molybdenum in cast iron, describing the properties imparted to cast iron by the use of this metal and the many applications of molybdenum-cast iron.

This company also issues a monthly publication entitled "The Moly Matrix," giving information on the latest improvements effected in steel and cast iron by the use of molybdenum.

Widia Cemented-Carbide Tools

THOMAS PROSSER & SON, 15 Gold St., New York City. Handbook and catalogue on Widia cemented carbides as used in tools, wear-resisting parts, and similar applications. This handbook, containing 24 pages, 8 1/2 by 11 inches, covers methods of manufacture, characteristics, and advantages obtained through the use of Widia cemented carbides. It lists the various grades available and their applications, and gives recommendations in regard to their use. Other sections are devoted to correct tool design, the practical application of metal-cutting theory, the advantages obtained from high speeds, recommended grinding procedure, and brazing instructions, telling how users may make their own cemented-carbide tools. The book is profusely illustrated with photographs showing recent applications of Widia tools, including intricate cutters, wear-resisting parts such as sand-blast nozzles, centerless-grinder rests, thread guides, etc.

Abrasives

NORTON CO., Worcester, Mass. Pamphlet entitled "Abrasives—Their History and Development," outlining the story of the development of abrasive products from the earliest times to the present. The booklet describes the various fields in which abrasives are used and contains much general information of value on abrasive products—their manufacture, qualities, methods of varying physical properties, etc.

Bulletin describing the characteristics, properties, methods of manufacture, and uses of "Norbide," a new boron carbide material of extreme hardness, suitable for grinding cemented carbides.

Grinding Wheels

CARBORUNDUM CO., Niagara Falls, N. Y. Circular describing the characteristics and use of the new diamond wheels made by this company for grinding cemented carbides. Data on dressing, mounting and truing, wet grinding, and operating speeds are included.

Booklet entitled "A Treatise on the Grinding of Cemented Carbides," containing much valuable information for those interested in the grinding of cemented carbides, including selection of wheels, factors affecting grinding wheel action, and methods of grinding various classes of tools.

Gear Measuring Machines

FELLOWS GEAR SHAPER CO., Springfield, Vt. Bulletins illustrating and describing the Fellows No. 7M gear measuring machine for checking individual elements of gear teeth; the No. 4M involute measuring machine, primarily designed for inspecting the tooth shape of Fellows gear shaper cutters but which can be adapted for checking gears; and the No. 8M Red Liner for automatic gear inspection. The method of setting up and the operation of these machines are described, and complete specifications are given.

Carburizers

E. F. HOUGHTON & CO., 240 W. Somerset St., Philadelphia, Pa. Booklet containing information of Houghton's "Perliton" liquid carburizer. The booklet describes the characteristics and advantages of this new carburizing material, and shows graphs and photomicrographs illustrating results obtained with this carburizer in tests made under actual working conditions in large plants.

Stellite Products

HAYNES STELLITE CO., Kokomo, Ind. Second edition of a publication entitled "Hard Facing with Haynes Stellite Products," describing the economies of the hard-facing process; the materials used; applications in various fields, including specific figures of savings actually effected; procedure in hard-facing; Haynes Stellite metal-cutting tools; and the Hastelloys.

Die-Casting Machines

MADISON-KIPP CORPORATION, 203 Waubesa St., Madison, Wis. Bulletin 4050, illustrating and describing the "Kippcaster," a die-casting machine especially designed for the production of small parts at low die cost. The advantages of this method of producing small parts are pointed out, and examples of dies for this class of work, as well as typical castings, are illustrated.

Lubricants

SOCONY-VACUUM OIL CO., INC., 26 Broadway, New York City. Circular entitled "Milestones Along the Way," illustrating typical applications of Socony-Vacuum lubricants, chronologically arranged, from 1866 to 1934. The bulletin gives data on the increased production in the metal industries obtained by the use of these lubricants, and other data on cost reduction.

Pumps

WORTHINGTON PUMP & MACHINERY CORPORATION, Harrison, N. J. Bulletin W-318-B5, descriptive of Worthington two-stage volute centrifugal pumps. Bulletin W-122-S1, illustrating and describing Worthington steam pumps for marine service. Bulletin WP-1034, entitled "Worthington Service at a Century of Progress and Other World's Fairs."

Paints and Finishes

BAKELITE CORPORATION, Bound Brook, N. J. Booklet entitled "Integrity of Finishes," dealing with specialized finishes that give the maximum protection to metal, wood, and other surfaces. The pamphlet emphasizes particularly those qualities and characteristics of Bakelite synthetic resins that impart integrity to a paint product.

Turret Lathes

JONES & LAMSON MACHINE CO., Springfield, Vt. Booklet containing 32 pages, illustrating and describing the new J & L line of ram type universal turret lathes. A photograph of each machine is shown and a description of the use is given. Line cuts are included, giving the dimensions of the machines, together with complete specifications.

Arc Welding Machines

LINCOLN ELECTRIC CO., Cleveland, Ohio. Welder specification bulletin No. 302, containing general specifications for Lincoln SA300, SA400, and SA600 Shield Arc welders of the direct-current motor-driven type. The various units of this equipment are described, and construction and general assembly details are given.

Alloy Steels

TIMKEN STEEL & TUBE CO., Canton, Ohio. Bulletin entitled "Multiples at a Glance," containing a series of tables by means of which the steel user can tell at a glance either how long his stock must be to furnish a definite number of multiples or how many multiples can be cut from a given length of stock.

Industrial Cable

GENERAL ELECTRIC CO., Schenectady, N. Y. Catalogue GEA-1838, listing and describing all the standard types of insulated wire and cable used in the industrial field for transmission, distribution, and control or used with electric equipment, such as mining machinery, locomotives, arc welders, etc.

Electric Control Equipment

ALLEN-BRADLEY CO., 1331 S. First St., Milwaukee, Wis. Price sheets comprising the first section of the Allen-Bradley catalogue which is now being revised. The sheets issued cover automatic starting and reversing switches, rheostats, speed regulators, magnetic contactors, etc.

Arc-Welding Machines

AIR REDUCTION SALES CO., 60 E. 42nd St., New York City. Folder outlining the features and advantages of Airco-Wilson arc-welding machines. Complete data on these machines are given, including current range, ratings, maximum electrode sizes, shipping weights, etc.

Ball Bearings

NEW DEPARTURE MFG. CO., Bristol, Conn. Booklet entitled "Let's Can the Oil Can," describing New Departure self-sealed, self-lubricated ball bearings, which are lubricated at the time of assembly and require no further lubrication afterward.

Temperature Control Equipment

LEEDS & NORTHRUP CO., 4901 Stenton Ave., Philadelphia, Pa. Application Bulletin 53-116, describing the Leeds & Northrup temperature-limit control for protecting furnace roofs from becoming overheated.

Welding and Cutting Equipment

ALEXANDER MILBURN CO., 1416 W. Baltimore St., Baltimore, Md., Catalogue covering the Milburn line of oxy-acetylene apparatus, cutting and welding tips, paint spray equipment, and portable carbide lights.

Indicating, Controlling, and Recording Instruments

BRISTOL CO., Waterbury, Conn. Bulletin 424, describing the features, principle of operation, and uses of the Bristol Metameter for measuring pressure, liquid level, temperature, flow, and motion.

Steel

REPUBLIC STEEL CORPORATION, Youngstown, Ohio. Bulletin 135, entitled "Republic Steel," containing twelve pages of illustrations showing exhibits of Republic products at the Century of Progress Exposition in Chicago this year.

Electric Equipment

ROLLER-SMITH CO., 233 Broadway, New York City. Catalogue 5, announcing a new line of heavy-duty air circuit breakers. The outstanding features of the new line are graphically set forth on pages 3 and 4 of the catalogue.

Speed Reducers

D. O. JAMES MFG. CO., 1120 W. Monroe St., Chicago, Ill. Pamphlet showing installations of D. O. James speed reducers in the new Chicago Post Office for operating 24 miles of conveyors and 49 miles of belting.

Welding Equipment

RICH MFG. CO., LTD., 3851 Santa Fe Ave., Los Angeles, Calif. Leaflet containing data, including dimensions and prices, on "Stroco" welding rods, classified according to the material they are adapted to weld.

Cold-Drawn Steel

UNION DRAWN STEEL CO., Massillon, Ohio. Circular entitled "Cold Finished Steel and the Automobile," describing the advantages of the use of cold-drawn steel in the manufacture of automobiles.

Diesel Engines

INGERSOLL-RAND CO., 11 Broadway, New York City. Catalogue describing the Ingersoll-Rand stationary type of Diesel engine, which is built in sizes ranging from 175 to 1500 brake horsepower.

Rebuilt Machine Tools

J. L. LUCAS & SON, INC., Bridgeport, Conn. List No. 83, covering the various types of rebuilt metal-working machines that this company has in stock.

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Ingersoll Die-Sinking Machine

Recent developments in the building of automobile bodies call for dies of much larger size than those previously used. This has created a need for new machines for die-sinking. The Ingersoll Milling Machine Co., Rockford, Ill., recently built an entirely new type of die-sinking machine for the Fisher Bodies Division of the General Motors Corporation. This machine will handle die-blocks up to 14 feet long, 10 feet wide, and 7 feet high. The weight of the machine is 350,000 pounds. It is capable of performing die-sinking operations with tolerances as close as 0.001 inch.

There are two heads mounted on the rail. One of these has a vertical spindle known as the "standard" spindle. The second head carries the "ram" spindle—a horizontal spindle mounted at the lower end of a ram that has 48 inches of vertical movement. The ram is mounted in a cylindrical barrel with a graduated dial at its lower end. This provides for setting the ram spindle at any required angle.

Three different feeds are available—the horizontal table feed; the horizontal feed for either head along the rail; and the vertical feed movement of each spindle. For following the irregular contours of a die, two feed movements are used in combination. It is generally the practice to use one uniform feed movement (say, of the table), and then vary the rate of feed of the spindle in order that the milling cutter may follow the required path. This variation in the feed movement is accomplished by electrical controls which enable the operator to regulate the rate or reverse the direction of the feed.

The feeds may be controlled

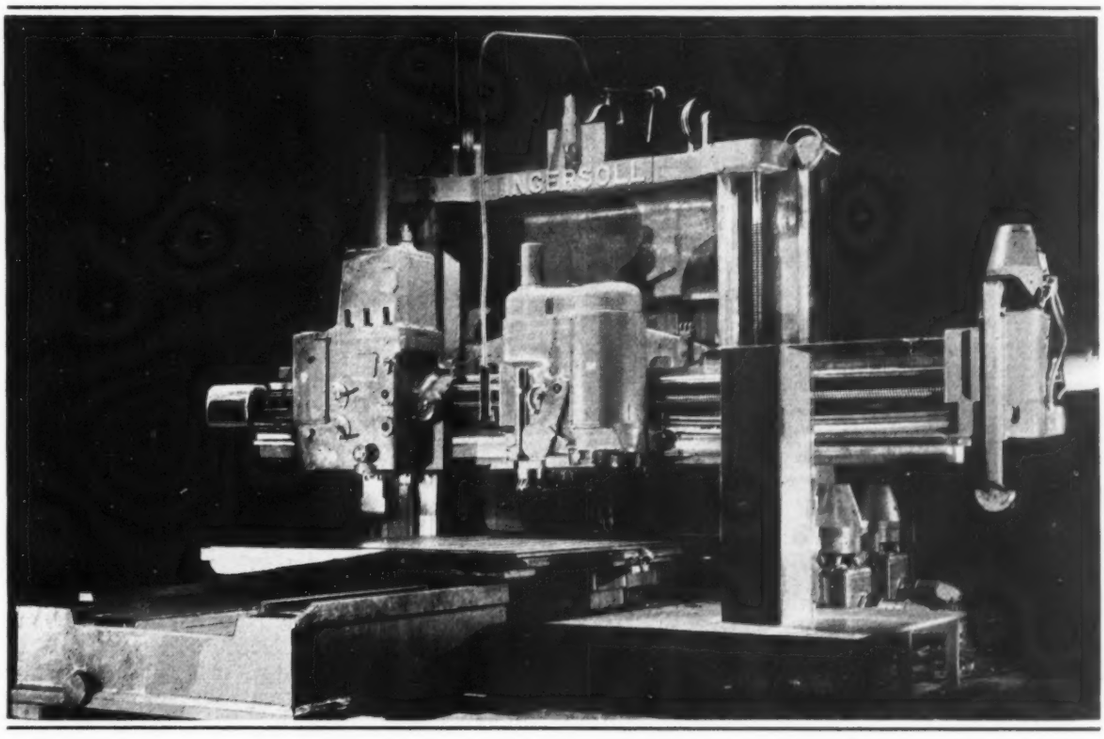


Fig. 1. Ingersoll Die-sinking Machine Capable of Handling Die-blocks up to 14 Feet Long, 10 Feet Wide, and 7 Feet High

either from the main control panel, Fig. 2, or from the pendent control panel, Fig. 3, hanging by an armored conduit in front of the machine. A switch on the main control panel selects either control at the choice of the operator; but after the machine is started, the operator employs the pendent control, because it is more convenient when watching the progress of the work. As the pendent is moved back and forth across the machine, it is always located at the same distance from the rail, through the operation of a specially designed parallel movement; thus it is always in the most convenient location for the operator.

The outstanding feature of the machine is the electrical apparatus for controlling all the movements. On the main control panel there are two vertical rows of dials. At the left, the two upper dials are for regulating the rate of speed of the spindles. The hands on these dials indicate the positions of rheostat arms through which are governed the speeds of the two spindle driving motors. Similarly, the three lower dials in the left-hand row are for setting the rate of the feed of the head, table, and rail, respectively. On all of these five dials, the position of the hand indicates the approximate rate of speed or feed. The companion dial in the row at the right shows the revolutions per minute of the spindles, and the feed, in inches per minute, of the head, table, and rail. Down the center of the panel there are five small panels, each having a group of push-buttons. This group is the same as that on the pendent. These buttons control all the movements of the machine.

In starting the machine, the first step is to set the hand on each speed dial for the number of revolutions wanted. This is accomplished by manipulating the required buttons and can be done before the main switch has been turned on. To operate the machine, however, the main switch, must be on. Then, to obtain any feed movement, the operator pushes the corresponding "run" button. This closes the circuit for the required feed movement, which continues until the "stop" button on the same panel is pushed. The change in direction of a feed movement is controlled by reversing switches. Provision is also made for feeding the heads to the left or right on the rail.

The head and table feeds can be varied from 3/4 inch to 36 inches per minute; the traverse is at the rate of 15 feet per minute. The changes of head, table, or rail feed are accomplished by three changes of gears controlled by conveniently located levers. Each feed is operated through a separate motor.

The ram spindle speeds range from 10 to 160 revolutions per minute, and are controlled by levers on the ram head. The standard spindle speeds vary from 7 1/2 to 122 revolutions per minute, and are controlled by levers on the head. On the pendent there is a bar at the bottom, and on the main control panel there is a similar bar under each group of buttons. By pushing in these bars, the power is instantly shut off and all movements are stopped. In addition, safety trips are provided for all movements where limit stops are required.

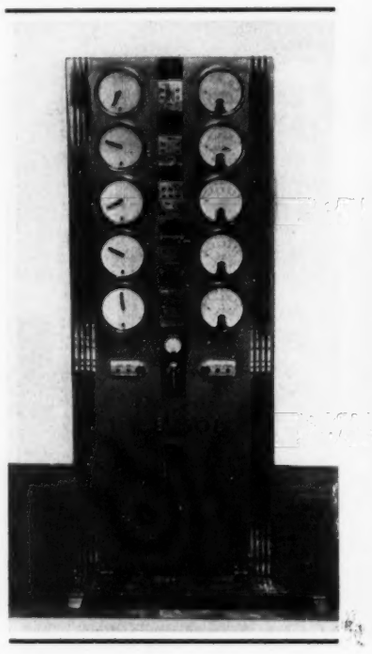


Fig. 2. Main Control Panel of Die-sinking Machine which is Mounted to the Right in Fig. 1

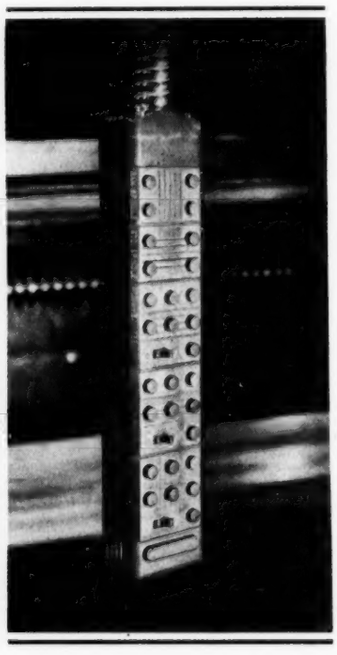


Fig. 3. Pendent Control Panel, by which Operator Controls All Movements of the Machine

General Electric Disk Type Electric Brake

A compact, smooth-acting, disk type electric brake, designed to be mounted directly on a motor, has been added to the line of solenoid- and thrustor-operated brakes made by the General Electric Co., Schenectady, N. Y. The new brake is intended particularly for controlling small hoists, cranes, winches, and similar equipment. It is suitable for applications requiring no more than 50 pounds-feet braking torque on a continuous basis or 75 pounds-feet on an intermittent basis.

The brake is obtainable completely mounted and wired as an assembled unit on squirrel-cage, wound-rotor, or single-phase and direct-current motors, in NEMA frames. It is also available separately, and can be easily adapted to floor mounting for use with motors already in service.

Fosdick Economax Upright Drilling Machines

An upright drilling machine made in 21-, 25-, and 30-inch sizes and in three types has been developed by the Fosdick Machine Tool Co., Cincinnati, Ohio. Twelve changes of spindle speed are obtained by the movement of a single lever. A single lever also controls the nine changes of feed available. Other features of the machine designed to insure maximum production, ease of operation, economy, and accuracy include centralized control; spindle reverse multiple-disk clutch drive; alloy steel gearing; multiple-splined shafts with integral keys; ball and roller bearing mountings; positive feed clutch; automatic depth gage; full spindle travel beyond depth gage trip; and single levers for clamping head or table.

The twelve spindle speeds of the gear-driven machines, shown in Figs. 1 and 2, are in geometric progression and have a range from 60 to 1500 revolutions per minute; an indicator on the change-gear lever shows the exact speed of the spindle for each position. Only twelve gears are employed in the entire unit. These are of the selective sliding type transmission. A spray of oil from the submerged constant-speed pump provides lubrication for all moving parts.

The spindle nose has a No. 4 Morse taper and a driving slot with a hardened steel insert. The drive to the spindle from the motor is directly through a pinion and gear to the start, stop, and reverse multi-disk type clutches. The nine feeds controlled by the single lever with direct-reading index range from 0.005 to 0.043 inch per revolution of the spindle. The positive feed clutch can be tripped at a predetermined depth with great accuracy. After the feed is tripped, the spindle can be advanced by hand the remainder of the way.

A positive hand stop can be set by a direct-reading graduated dial for accurate spot-facing, counterboring, or gap drilling. This hand stop can be used for work where more than two depths are required. An interlock between hand and power feed stops prevents any chance of accidents if the hand feed is set ahead of the power feed. Automatic trips disengage the feed at both ends of the travel. The sliding head is counterbalanced and is raised and lowered by a fixed handwheel. A self-compensating single lever clamp holds the head rigidly to the column.

The column of the box-column machine, shown in Fig. 1, is made in one piece and is designed to eliminate any tendency to bend and distort when doing heavy drilling. The column of the round-column machine, Fig. 2, is additionally braced at the center of the rear support to increase the rigidity. The table arm in which the round table pivots may be swung around the column and raised or lowered.

The motorized-spindle upright machine, shown in Fig. 3, is designed to meet the demand for single-purpose operations, but it can also be used for general drilling. The spindle speeds range from 78 to 1800 revolutions per minute. One to nine feed changes are obtainable, with a range of 0.005 to 0.043 inch per revolution of the spindle.

All speed and feed changes are

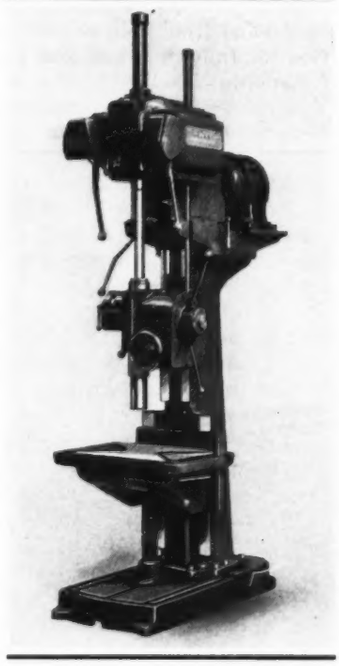


Fig. 1. Fosdick Box-column Economax Upright Drilling Machine

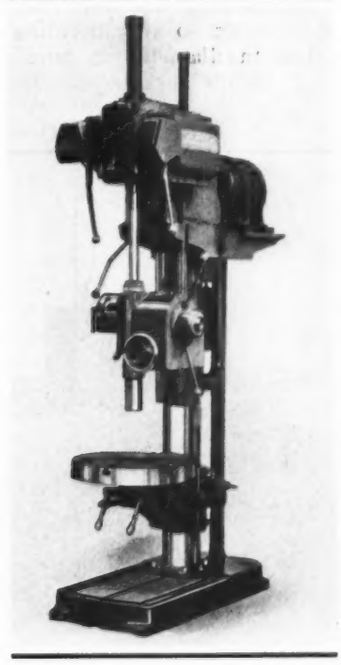


Fig. 2. Economax Round-column Drilling Machine

Fig. 3. Motorized-spindle Economax Upright Drilling Machine

obtained by means of single levers. Reversal of the spindle for tapping is accomplished through a reversing switch located on the sliding head. This switch is also used to stop the spindle. Special fixtures, multiple drill heads, and other special attachments can be obtained, and the spindle speeds and feeds can be changed at any time at small cost.

Any speed motor from 1200 to 1800 revolutions per minute can be used on the gear-driven machines. The motorized-spindle machine can use a constant-speed motor, and when more than one spindle speed is required, a multi-speed motor is furnished with speeds of 450 to 1200 revolutions per minute, or 600 to 1800 revolutions per minute. A drum control is furnished when using a multi-speed motor.

Barnes Drill Co.'s No. 5 Horizontal Hydraulic Honing Machine

The hydraulic horizontal honing machine here illustrated has been built by the Barnes Drill Co., 814 Chestnut St., Rockford, Ill., for honing long work, such as tubing and cylinders of such large size or length as to prevent handling on vertical type machines. This machine is available in various sizes and lengths of spindle travel.

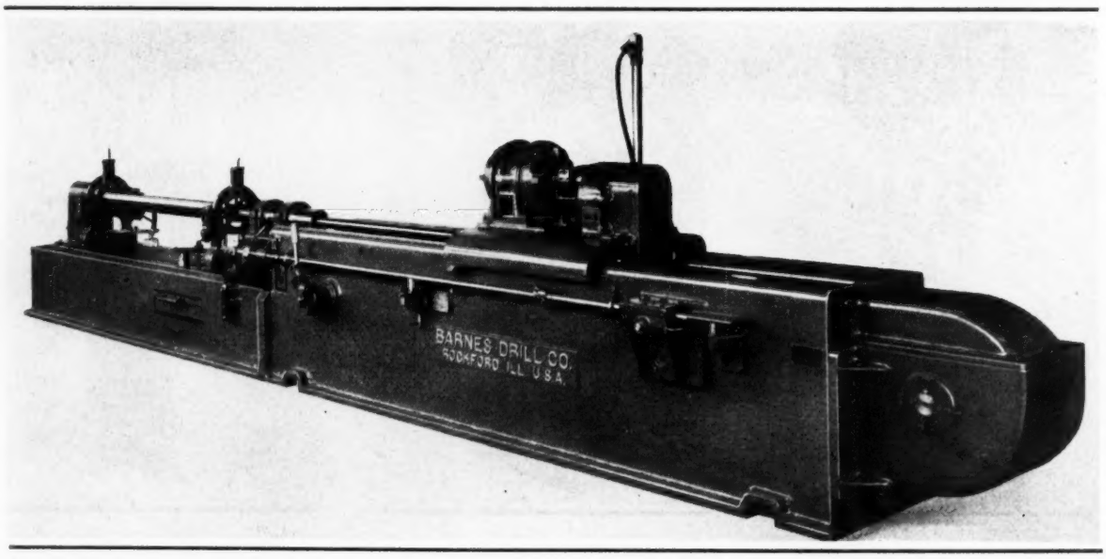
Many of the patented features which have proved successful in previous honing machines developed by this company have been incorporated in this machine. Several new and unique features have also been added, including the method of reciprocating the carriage, on which is mounted the spindle, which is driven from the electric motor on the carriage. A fluid motor, not shown, is used, which gives the full hydraulic action, the same as that obtained with a hydraulic cylinder, yet makes possible a main bed of much shorter length.

The master lever at the operator's station near the middle of the machine controls starting and stopping of the spindle rotation, as well as starting and stopping of the spindle reciprocation. Auxiliary means are supplied for short-stroking at any point in the entire spindle travel, a desirable feature for the removal of taper and high spots in cylinders.

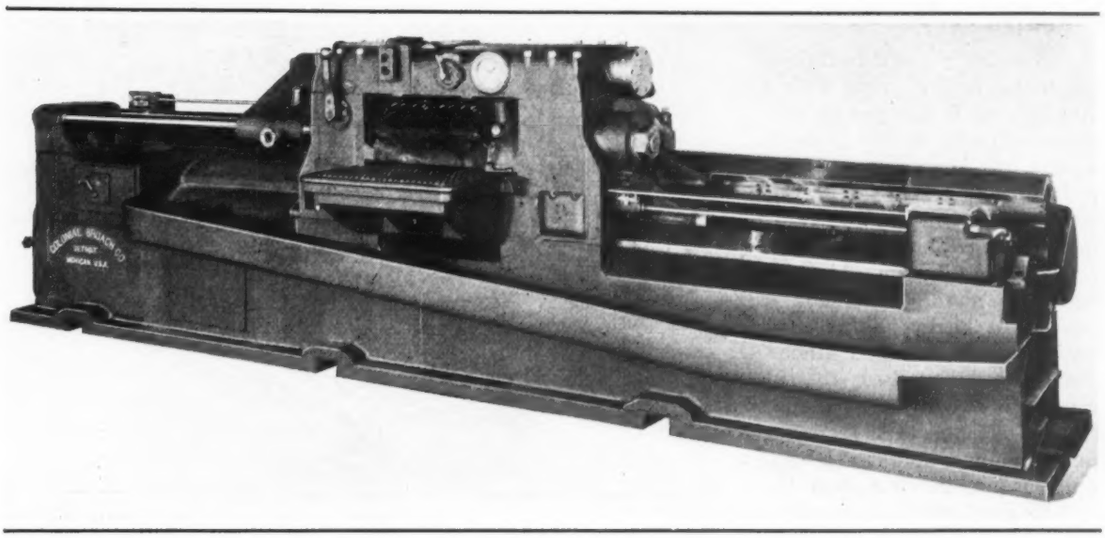
This honing machine handles all bores up to and including 5 inches in diameter in iron or steel. While the machine illustrated has a 6-foot spindle travel, machines can be furnished for longer or shorter travel, as required. The No. 10 and No. 15 horizontal honing machines made by this company are adapted for larger and heavier work. The outer work-supporting bed contains the coolant reservoir and a filter of large capacity. A suitable hone and hone-guide bushing or cradle are supplied, according to the requirements of the work. The illustration shows the machine set up for honing steel tubing 5 feet long, which is held in temporary fixtures.

The coolant is fed through the anti-splash guard from the rear end of the tubing, and the overflow of the coolant is carried through the oil channels to the front end of the work-supporting bed where it cascades into the settling tank and is automatically filtered. The filtering of the coolant before it goes back to the work is a very essential feature.

This line of horizontal honing machines, although built in three major sizes, may be specially equipped to suit the class of work to be honed. The spindle rotation and reciprocation are arranged to suit the job. Take-off gears provide for any desired speed, and the volume control gives an infinite range and rate of stroking.



Barnes Drill Co.'s Hydraulic Honing Machine Developed for Handling Long Tubes and Cylinders



Colonial Hydraulic Broaching Machine in which the Broach is Operated Automatically

Colonial Two-Way Hydraulic Broaching Machine

Completely automatic operation of the broach is an important feature of a special horizontal broaching machine recently developed and built by the Colonial Broach Co., 147 Jos. Campau Ave., Detroit, Mich., in cooperation with the Sterling-French Machinery Co. of the same city. As the broach is advanced and returned automatically, the operator is left free for loading and unloading the work. In the illustration, this machine is shown tooled up for align-broaching three camshaft holes in automobile cylinder blocks. The cutting speed of the ram is 45 feet a minute, and the rapid return 60 feet a minute.

The work fixture is located on a level with the conveyor that brings the cylinder blocks to the machine, so that the operator can conveniently slide them into place. The cylinder blocks are pushed over a serrated plate that cleans the bottom surfaces. Each block is pushed against two temporary locating stops in the fixture, but it is accurately located by plungers, actuated through a lever that also controls the hydraulic equipment and thus governs the operating cycle of the machine. With this arrangement, the cylinder block must be aligned accurately with the broach before the machine can be started.

Upon the completion of the broaching stroke, an auxiliary oil cylinder pushes the cylinder block from the broaching position to the front loading station. The operator then slides the block on the conveyor line, while the broach is returned to the starting position to complete the cycle.

Although the machine shown is especially designed for the operation on cylinder blocks described in the foregoing, it can also be built to any size for the surface or hole broaching of other parts. It is of heavy welded-steel fabrication and is built to withstand high broaching speeds without chatter. The base and slide are set at an angle to facilitate carrying the chips away from the broach and the fixture.

There are four compartments in the base, one for the motors, another for the hydraulic equipment, a third that serves as an oil tank of unusually large capacity, and a fourth for the coolant and chips. A force-feed lubrication system delivers a measured amount of oil to all reciprocating parts at each cycle of the machine. The coolant system delivers coolant only when the broach is actually cutting. The gage at the front of the machine records the broaching pressure. An emergency lever provides for instantly stopping the machine should the occasion require it.

Gear Lubricant for High Pressures

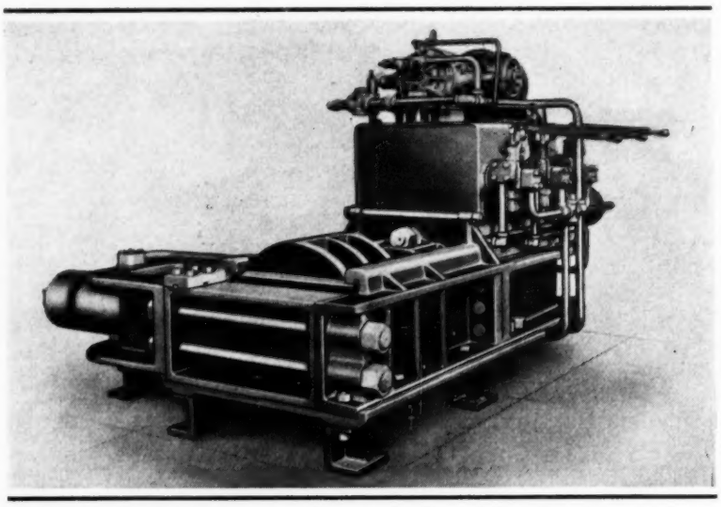
A new type of lubricant, intended especially for the lubrication of heavy-duty gears, has been added by the E. F. Houghton & Co., Philadelphia, Pa., to the series of oils bearing the brand name "Sta-Put." The addition is known as "Sta-Put 600 Series extreme pressure gear lubricant," and has been developed to withstand from three to five times the load per square inch that straight mineral oils of the same type, but without the "extreme-pressure" characteristics, are capable of doing.

It is further stated that actual torque readings prove that these lubricants will carry these high loads with frictional losses reduced as much as from 30 to 50 per cent, compared with the results obtained with the same oils before treatment. This lubricant is equally applicable to light-duty speed reducers and heavy worm or herringbone type reducers.

Scrap-Metal Baling Press

A completely self-contained scrap-metal baling press with a motor-driven Hydro-power unit mounted directly on the press at one end has been developed by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. The press comprises a box, built up of massive ribbed steel castings to take loose scrap metal. This box is closed by a heavy sliding door actuated by a hydraulic cylinder.

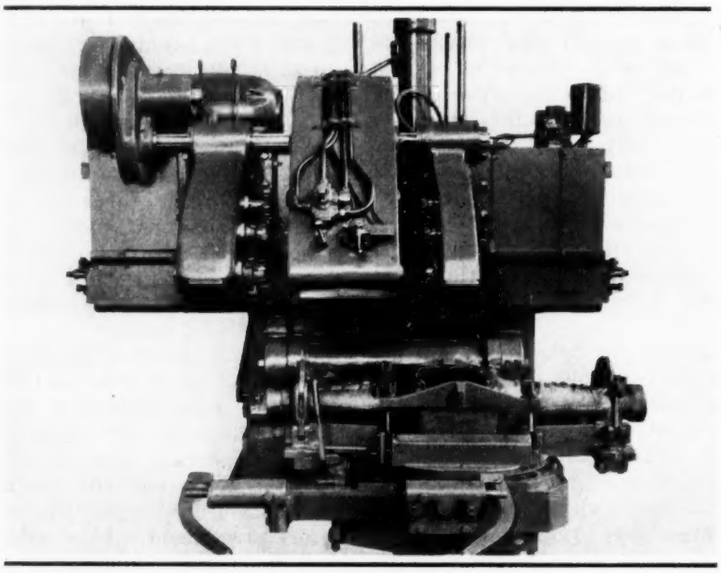
Pressure is applied to the scrap from two directions, first from the end and then from the side, by platens, operated by hydraulic rams, moving into the box. The application of the pressure is controlled by means of three lever-actuated valves. Two pumps, each of the rotary high-speed oil-pressure type, build up the pressure. Among the features emphasized are compactness, smooth action, speed of operation, ease of control, and the production of bales of high density.



Scrap-metal Baling Press Built by the Hydraulic Press Mfg. Co.

Moline HF-140 Special Hydraulic Horizontal Boring Machine

The Moline Tool Co., Moline, Ill., has added to its line of boring machines a special horizontal machine for boring and facing rear axle housings for tractors, automobiles, and trucks. The column carries two opposed slides, gibbed to it. On each of these slides is mounted a spindle housing having three short rugged spindles running in preloaded, anti-friction, oil-seal bearings.



Special Horizontal Boring Machine and Equipment Developed by the Moline Tool Co. for Boring and Facing Rear Axle Housings

Power is transmitted to the machine from a motor by means of V-belts, and by hardened alloy spiral spur gears to the spindles, on which are mounted multiple-blade boring and facing tools. The spindles are opposed and are located on arms that project downward from the slide toward the work-table. The two lowest spindles are used for the roughing operation, the two center ones for the semi-finishing, and the two top ones for the finishing operation. The spindles are not in a straight line, but are located on a common arc, the center of which is the pivoting point of the table and fixture.

The spindles on the left side are used for boring the outside of the holes, and the spindles on the right side are used for boring the inside holes. The cycle of the machine is such that after the work has been clamped in the fixture, the table is elevated hydraulically to the rough-boring position. This movement of the table is accomplished by means of a valve mounted on the overhanging arm in the center of the machine, within easy reach of the operator. When the table and fixture reach the first position, the locating pins are inserted in the locating bushings, and the feed of the spindles is started by moving the lever controlling the hydraulic feed valve.

The spindles feed the cutters inward until they have reached

a predetermined depth, at which point they dwell slightly to insure cleaning up the cut, and then return to the starting position. The locating plungers are next withdrawn, the table is elevated to the second position for the semi-finish boring operation, and finally to the third position for the finish-boring. Then, by the operation of a valve, the table is lowered to its original loading position. The fixture is now indexed 180 degrees and the operations are repeated, thereby completing the boring and facing of the four bearing seats in the rear axle housing. The timing of the working cycle is done by adjusting the hydraulic valves. Moving parts that do not run in oil are lubricated by a one-shot oiling system. The approximate weight of this machine is 20,000 pounds.

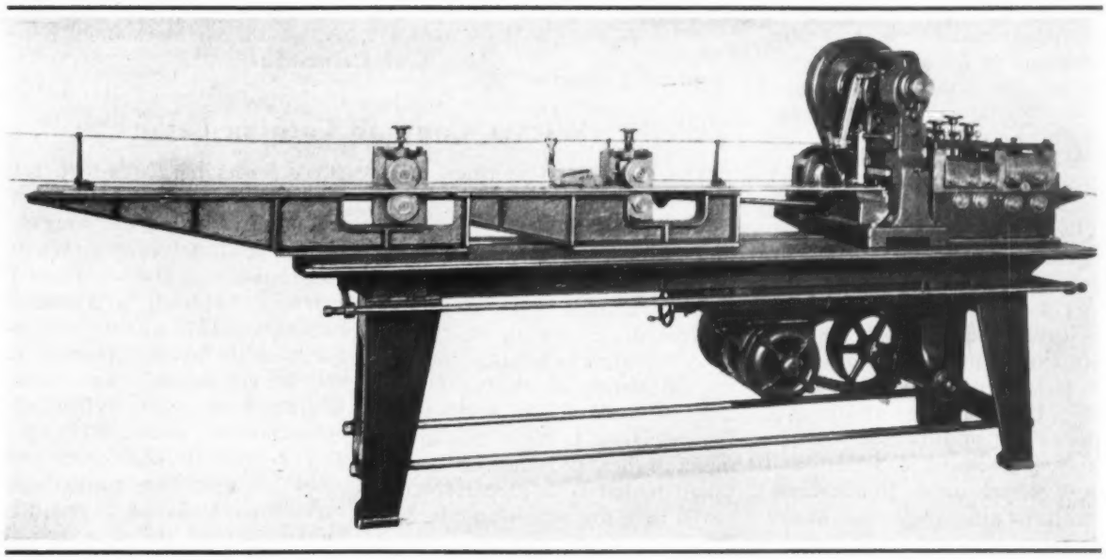
New Type of Grease Gun

The Lubrication Corporation, 910 S. Michigan Ave., Chicago, Ill., has developed a new type of grease gun, and the Standard Oil Co. of Indiana is supplying greases packed in cartridge form for use with this grease gun. To fill the new type of grease gun, the operator simply slips the factory-loaded cartridge into the barrel of the gun.

The cartridges are being made of one-pound capacity and are supplied with different grades of lubricants. The method works equally well with fluid gear lubricants or fairly stiff grease. A partially used cartridge can be quickly replaced with another having a different grade of lubricant; the lubricant in the used cartridge, being enclosed, is not wasted.

Tishken Stock-Straightening and Cutting-Off Machine

Coiled strip stock can be straightened and cut off into accurate lengths at speeds ranging from 50 to 175 feet a minute on the machine illustrated, which was recently built by Tishken Products, 4744 Twelfth St., Detroit, Mich. The cut-off lengths may range from 4 to 10 feet. Pieces 10 feet long are cut within an accuracy of 1/64 inch. The ends of the strip stock can be cut square, notched, or irregular. Holes can be punched through the ends of the strips, if desired, or identification numbers, etc., can be stamped on.



Tishken Machine Designed for Straightening Coil Stock and Accurate Cutting-off to Length

At the right-hand end of this machine there are two pairs of driven feed-rolls. The two upper feed-rolls are raised at the instant that the stock is cut off, so that the strip momentarily remains stationary. At the left of the feed-rolls there are five straightening rolls, two below the stock and three above. At the left of the straightening rolls is a small-size punch press which cuts off the stock as required, punches holes, stamps numbers, etc. The dies can be readily interchanged to meet requirements. This unit is individually driven by a motor through V-belts.

The punch press is actuated as the front end of the stock reaches a stop on the carriage (seen on the long table) and moves the carriage about 3 inches. During this movement, a rod that connects the carriage to a lever on the punch press is pulled toward the left to actuate a clutch that operates the press ram at the proper instant. When the press ram descends, it operates a second rod connected to a stock stop on the carriage, which raises this stop and thus enables the cut-off strip to be carried

past it. The stop then drops into position again to regulate the length of the next strip to be cut off.

Each piece of cut-off stock can be automatically fed from this straightening and cutting-off equipment direct to a roll-forming machine or a punch press. This is accomplished by means of the two pairs of feed-rolls mounted on the long table. These feed-rolls are driven by means of the motor and the variable-speed unit that are mounted beneath the table, this equipment also supplying the power for driving the feed-rolls at the right-hand end of the machine. The approximate weight of this equipment is 5460 pounds.

Larger Size "Hercules" Nut Runner

The Buckeye Portable Tool Co., Dayton, Ohio, has placed on the market a larger size of the type of nut runner that was illustrated and described in May MACHINERY, page 576. The new size is known as the Model No. 40-N. It has a speed of 750 revolutions per minute and a capacity for standard 3/8-inch and light 1/2-inch nuts. In construction, it is similar to the model previously described. It weighs 16 1/2 pounds, and has an overall length of 14 1/2 inches.

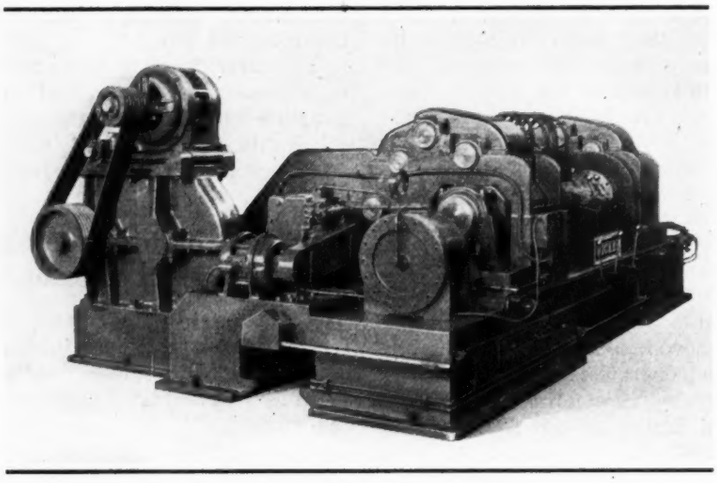


Fig. 1. Wickes Contour Turning Lathe for Machining Six-throw Crankshafts

Wickes Contour Turning Lathe

The contour turning lathe shown in Fig. 1 is one of a new line of lathes recently developed and placed on the market by Wickes Bros., Saginaw, Mich. This machine, with the tool equipment shown in Fig. 2, is used for simultaneously turning the contours on twelve crank-arms of a six-throw, seven-bearing crankshaft. With this equipment, a heavy roughing cut is taken which is immediately followed by a fine finishing cut. The crankshaft is supported in and driven by a heavy pot chuck at each end, and is supported on the three center bearings by a roller rest.

The lathe has a net weight of 62,000 pounds. A 30 horsepower constant-speed motor drives the machine through a speed reducer. Separate motors are used for the hydraulic pumps and cooling compound. The base of the machine is of welded steel construction, being built up of 1 1/2- and 2-inch cross-rolled steel plates. The rugged construction employed is required on account of the size and extreme hardness of the crankshaft to be machined, which has a Brinell hardness up to 385. A machine similar to the one illustrated is used for simultaneously turning the twenty-four chamfers on the crank-arms.

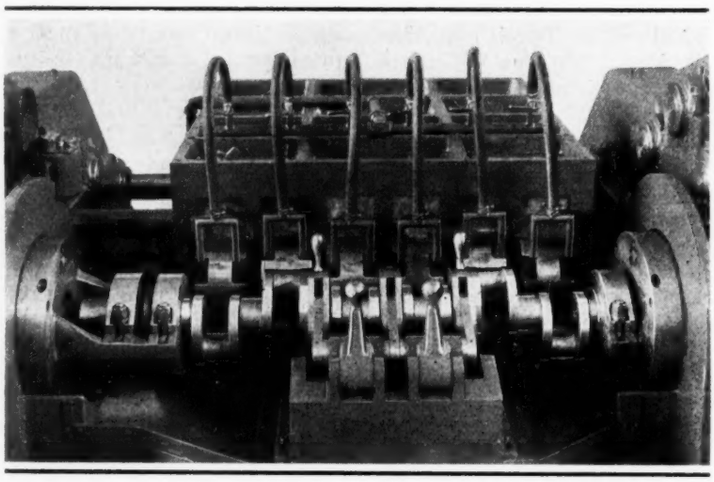


Fig. 2. Close-up View of Tool Equipment of Machine Shown in Fig. 1

Metal Tables for Shop Use

A new all-steel table for use in shops and factories has been placed on the market by the Angle Steel Stool Co., Plainwell, Mich. With the exception of the drawer, this table is fabricated entirely from 16-gage metal. It has tapered legs, simple lines, and is very rigid. The size is 42 by 26 by 30 inches high, with a drawer 26 by 22 by 3 1/2 inches high. These tables are finished in olive green.

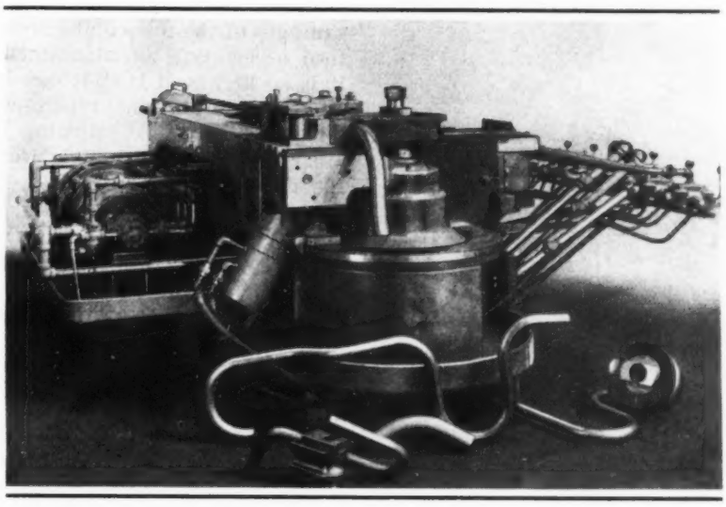


Fig. 1. Williams, White & Co.'s Universal Tube Bender with Bending Dies and Examples of Work Shown in Foreground

Williams Universal Tube Bender

A high-speed, hydraulically operated, universal tube-bending machine has been placed on the market by Williams, White & Co., Moline, Ill. These machines have been designed to take care of the tube-bending requirements of manufacturers of boilers, heaters, locomotives, railway cars, steamships, and of the automotive, plumbing, or other industries in which formed or bent tubes and pipes are used.

All moving parts of the machines are hydraulically driven through racks and pinions, relief valves being provided which prevent breakage. Other features of construction are a clamp of the toggle type designed to insure a positive grip that will prevent slippage; provision for unloading the tube after bending without requiring the operator to touch the dies; facilities for making either right-hand or left-hand bends; a table that drops away at the front end to allow short bends to project downward, as shown in Fig. 1, so that another bend can be made at right angles to the preceding one (this feature makes it unnecessary to change the machine from right- to left-hand for many jobs); a cross-clamp that holds the work for either right- or left-hand bends; provision for applying bending pressure directly to the cast-steel swinging arm and not to the shaft that supports the die; an adjustable automatic stop and graduated table front designed to reduce the set-up time to a minimum; graduations on the rear table which simplify the setting of the arbor pull cylinder for changes in radius; bending dies that are made to work either right- or left-hand by reversing their positions or turning them over, right to left. If desired, the bending mandrel can be pulled through the tube instead of pulling the tube off the mandrel, the die being turned over front to back.

The motors, pumps, relief valves and oil reservoir are located in the lower base casting. Pressure gages enable the relief valves to be adjusted so that the machine will use only the amount of power required.

These machines are built in four sizes. The smallest or 1 1/4-U machine requires a 15-horsepower motor operating at 1200 revolutions per minute, and will bend tubing up to and including 1 1/4 inches in diameter with a 3/16-inch wall to a radius of 6 inches. The 2-U size machine requires a 25-horsepower motor running at 1200 revolutions per minute, and will bend tubing up to and including 2 inches in diameter having 3/16-inch walls to a radius of 8 inches. The 3-U machine requires one 30-horsepower motor and one 10-horsepower motor, and will bend tubing up to 3 inches with walls 1/4 inch thick to a radius of 12 inches. The 4-U machine requires one 40-horsepower and one 10-horsepower motor, and will bend tubing up to 4 inches in diameter with walls 1/4 inch thick to a radius of 24 inches.

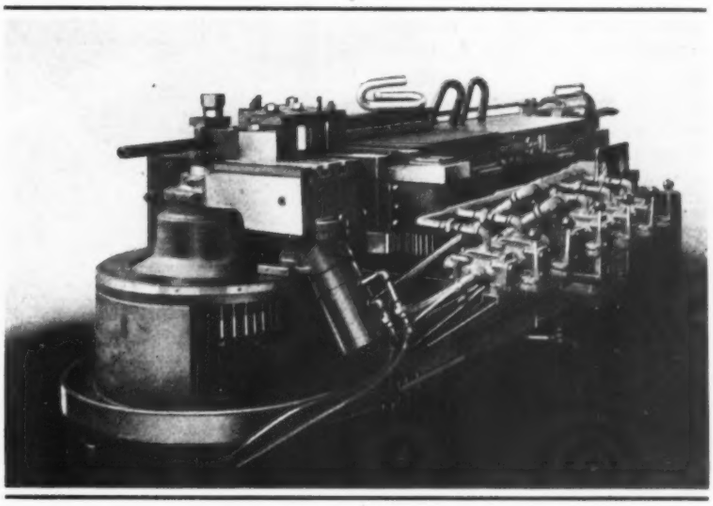
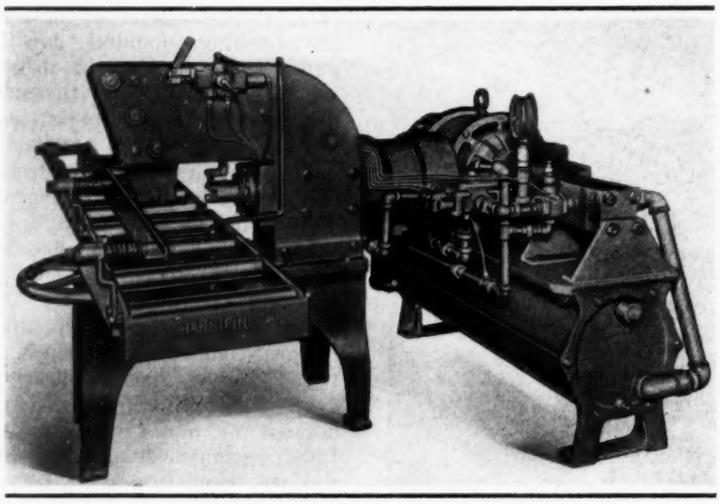


Fig. 2. View of the Operating Side of Machine Shown in Fig. 1, with Tube in Position for Bending



Fifty-ton Riveting Machine with Adjustable Conveyor Type Table

Hannifin Hydraulic Rivet Press

A 50-ton riveting machine that is entirely self-contained was recently built by the Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill., for heading several rows of 3/4-inch hot rivets on frames for crawler type tractors. As will be seen from the illustration, the machine is provided at the front with a roller-bearing equipped conveyor on which the work is advanced between the dies. This conveyor is adjustable vertically, so that the various rows of rivets can be brought into alignment with the dies.

The riveting cycle is actuated automatically by the hydraulic unit at the rear of the machine. As the operator moves a lever, the ram advances and actuates spring pressure pads that hold the work securely for the riveting. With the continued movement of the lever, the rivet is headed. Then, after a momentary dwell on the rivet under full pressure, the ram reverses automatically. Upon the completion of the reversal, the hydraulic unit idles at no pressure.

This hydraulic riveting press has a maximum working pressure of 1600 pounds per square inch, the pressure being adjustable to suit the heads of rivets smaller than 3/4 inch. The maximum travel of the ram is 5 1/2 inches. Power is supplied to this equipment by a 10-horsepower motor running at 900 revolutions per minute.

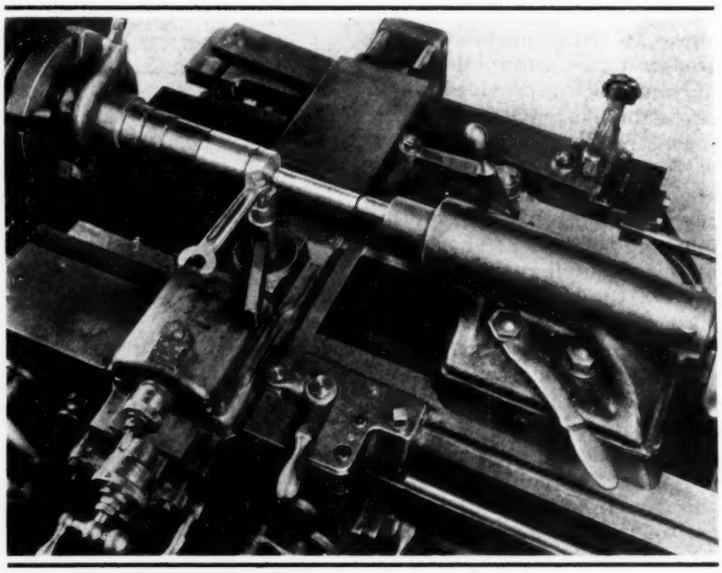
Reed-Prentice Taper Attachment

A new type taper attachment for lathes has been designed by the Reed-Prentice Corporation, Worcester, Mass. This attachment is intended for use in turning steep angle tapers, and is so designed as to retain all the advantages of the telescoping crossfeed screw type of attachment. It is so arranged that it can be used as a conventional type taper attachment or for turning a taper to any included angle up to 120 degrees.

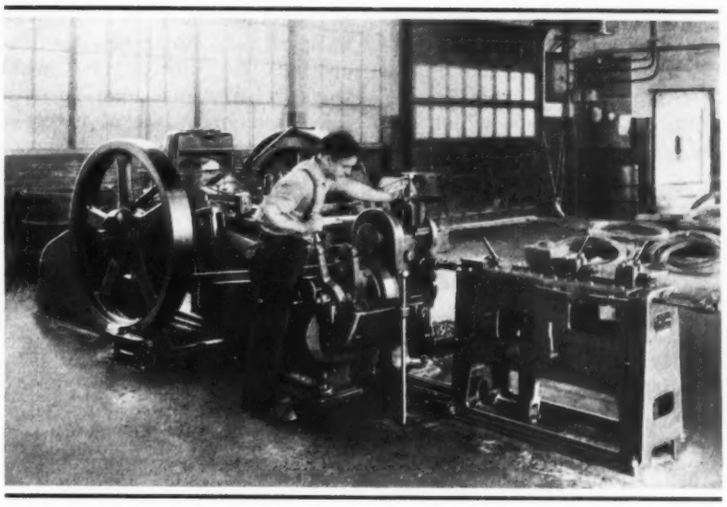
This attachment permits turning a straight portion on the work to a predetermined point, at which the taper attachment may be engaged and the taper turned to another predetermined point, where it may be disengaged and the machine allowed to resume straight turning. A scale at the left-hand end of the taper bar enables it to be set to the desired angle of taper and is arranged for indicating the included angles.

The angle of taper is dependent upon both the rate of movement of the slide relative to the carriage travel and the angularity of the taper bar. Safety stops are provided, so that the clutch is disengaged at the limits of travel of the slide.

The attachment can also be used for forming. It is unique in that the master form has greater length than the form produced on the work. This permits the use of a roller follower for producing relatively sharp corners on the work.



Taper Attachment Designed for Application to Reed-Prentice Sliding Gear Head Engine Lathes



Hogue Wire-drawing Attachment for Cold-header Built by the Ajax Mfg. Co.

Wire-Drawing Attachment for Cold-Heading Machines

The Hogue wire drawer here illustrated was announced recently by the Ajax Mfg. Co., Cleveland, Ohio. This attachment for cold-heading machines cold-draws and also coats hot-rolled, pickled, and limed rod as it is fed into the cold-heading machine. The advantages of this attachment as given by the manufacturers are: Reduces cost of material; draws fifteen sizes of wire from ten sizes of rod; is driven through a sprocket and chain from the header, thus requiring no additional power equipment; requires no additional labor or handling of material; draws wire from coils and straightens it for heading operations; maintains uniformly accurate size of wire taken from successive coils, as all wire is passed through the same die; and presents clean, coated wire to the forging machine.

In operation, the stock is fed intermittently into the heading machine by the feed-rolls in the usual manner. During periods between feeds, the stock is held securely by grips adjacent to the feed-rolls while a drawing die is pushed back along the rod a distance equal to the amount fed. When the rod is fed forward, the grips release, and the drawing die and the slide that carries it move forward, with the rod, into position to be pushed back again during the next stationary period.

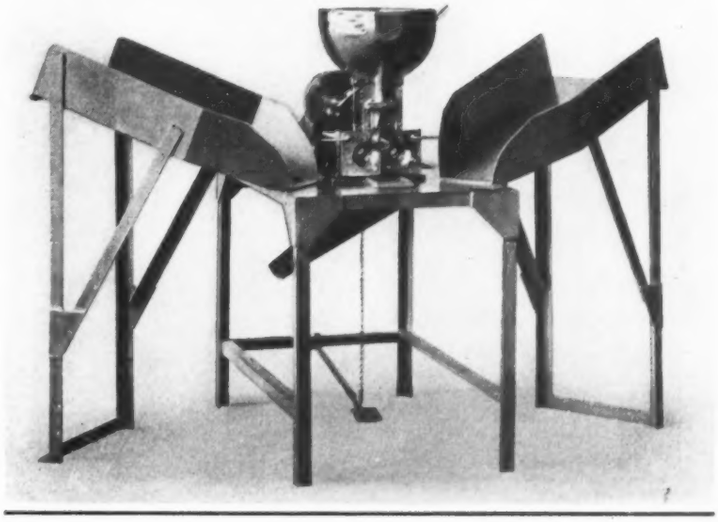
The slide that carries the drawing die is of box shape at the top and is filled with drawing and coating powder lubricant, which simultaneously coats the stock for cold-heading and extruding operations. Motion is imparted to the drawing die slide by a vertical lever fulcrum in the drawer frame beneath the slide, which, in turn, derives its motion through a long horizontal connecting-rod from an adjustable crankpin at the back of the heading machine. This machine is built in five sizes for drawing 1/4- to 7/8-inch rod.

Kent Nutting Machine

A machine for threading or assembling nuts on bolts, screws, or other fastenings 3/8 inch or less in diameter is being placed on the market by the Kent Machine Co., Cuyahoga Falls, Ohio. A production of 60 to 70 per cent above that obtained by the common bench spinner now in general use is claimed for this nutting machine.

The nuts are fed down two chutes from one hopper. At the bottom of the chutes they are transferred to rotating heads by specially designed spring-actuated plungers which are controlled by a foot-treadle operated by the machine attendant. The operator places two bolts in contact with the nuts, and the spinning action of the rotating heads threads the nuts on the bolts for their full thickness.

The machine is furnished with



Nutting Machine Developed by the Kent Machine Co. for Assembling Nuts on Bolts and Screws

a belt drive for mounting on the bench or it can be supplied with a direct-connected motor drive mounted on a table, as illustrated. This table arrangement provides a portable outfit, the cross-bars connecting the legs being the proper height for lift-truck transportation. The chutes at the sides of the table are for holding the bolts on which the nuts are to be threaded.

No. 51 Producto-Matic Planetary Milling Machine

Although the Producto-Matic miller here illustrated is an entirely new design developed by the Producto Machine Co., Bridgeport, Conn., certain basic principles incorporated in some of the machines previously made by this company have been retained. This machine is built with two vertical columns, each column carrying two cutter-spindles. It is designed to perform planetary milling operations—that is, the work revolves about the cutter.

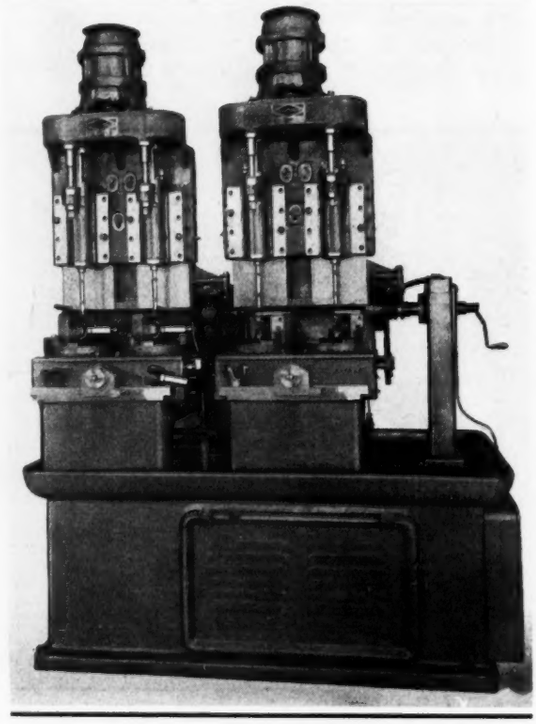
The vertical travel of the cutter-spindle assembly to the upper position is required only as a convenience in loading and unloading the fixture. This vertical travel is obtained through a drum cam mounted within the housing of the column. Each set of cutter-spindles is driven by an independent one-horsepower motor. An automatic switch is provided for stopping the cutters while loading and unloading.

Each work-fixture table has two distinct movements, one a lateral travel for setting the work in the proper position for milling to the correct depth, and another a circular motion which provides for a complete 360-degree movement of the work-fixture for finishing the cut around the piece. The whole work-fixture base can also be traversed in a lateral direction to bring the work and fixture away from the cutters in order to facilitate loading. Both movements — that is, the vertical travel of the cutters and the lateral and circular movement of the work-table—are properly synchronized.

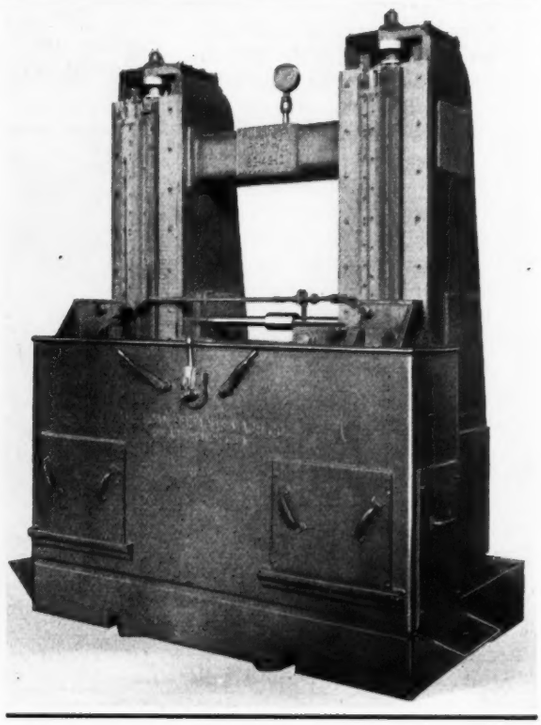
The machine is built with a double unit, so that the operator can load and unload one set of work-spindles while the other is in use. The feeding mechanism of the machine is driven by a five-horsepower motor. The machine occupies a floor space of 76 by 44 inches, and has a total height of 8 feet. The weight, including the fixtures, is 11,500 pounds.

American Surface Broaching Machine

A new line of hydraulically operated surface broaching machines known as the SB-42 series is announced by the American Broach & Machine Co., Ann Arbor, Mich. The "SB" stands



No. 51 Producto-Matic Planetary Milling Machine



American Hydraulically Operated Surface Broach

for surface broaching, and the "42" for the length of stroke obtainable. The SB-42-10 duplex machine shown in the illustration, for example, has a 42-inch stroke and a 10-ton capacity. It is arranged for broaching a flat and a bevel surface on the flanges at the ends of automobile rear-axle housings. This machine can be furnished with the slides arranged to operate simultaneously or independently, or so that one slide is on the cutting stroke while the other is returning. Stop-dogs are provided which can be set for any desired stroke.

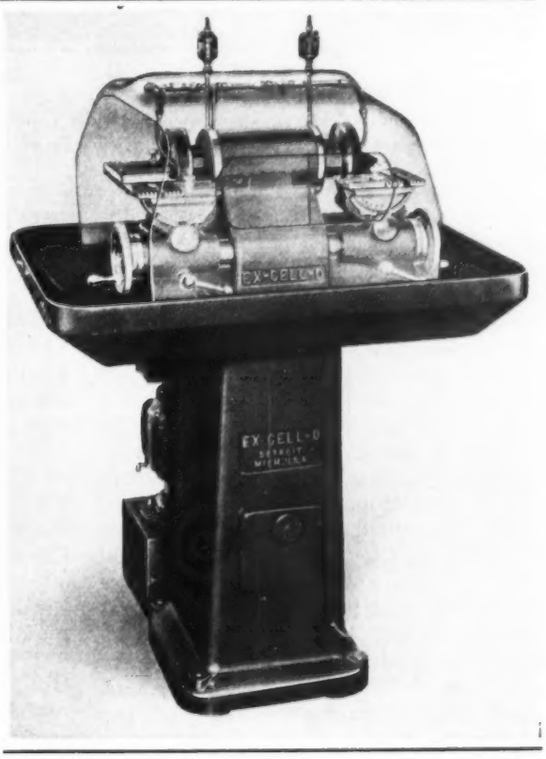
Machines of this type are made in single or duplex types, and in 6-, 10-, and 15-ton capacities. They are provided with variable-speed controls giving surface cutting feeds up to 30 feet a minute. The broach slide is also the cylinder. By incorporating the cylinder in the slide the use of projecting cylinders on top of the machine is avoided and considerable piping is eliminated from the outside of the machine. The machine is supplied with a hydraulic pumping unit submerged in the lower part of a column, which serves as a reservoir. The reservoirs of the single-column and duplex machines have capacities of about 40 and 80 gallons of oil.

Relief valves set for any maximum pressure are provided. A direct-reading gage shows the pressure exerted. The machines can be furnished with index work-tables, sliding work-tables for feeding work directly toward the broaching tool, or with tilting work-tables. They can also be furnished for automatic cycles, so that when the machine is started, the work will advance to the broach, the broach will make its cutting stroke, and the work will be withdrawn on the return stroke of the ram.

Ex-Cell-O Cemented-Carbide Tool Grinder with Diamond Wheels

Diamond-impregnated wheels are the main feature of a machine recently brought out by the Ex-Cell-O Aircraft & Tool Corporation, 1200 Oakman Blvd., Detroit, Mich., for grinding and finishing tungsten and tantalum carbide tools. It is claimed that this machine will increase the life of the tipped tools and materially reduce the time required for sharpening them. It is also claimed that the tips can be ground to much thinner sections without the danger of chipping and breaking, and that a keen, sharp edge with a smooth finish is obtained by a sharpening cut of minimum depth.

The balanced motor used to drive the wheels is of 3/4 horsepower. The wheels are kept clean and the generated heat is controlled by coolant supplied at the points of contact between the wheel and the tool. A reversible switch on the motor at the rear of the machine provides for the correct rotation of the wheels for both right- and left-hand tools. The tool-supporting tables at each end of the machine are provided with hardened and ground strips which form a smooth surface. Graduated adjustments on each table provide an accurate method of machining the correct rake and angle. Suitable tool-holders can be provided for sharpening boring tools and tools having round shanks. A large guard in the form of a hood covers the spindles and wheels, as illustrated.



Ex-Cell-O Diamond-wheel Carbide-tool Grinder

General Electric Automatic Timer for Welders

A new synchronous motor-operated timer for automatically timing the power supply to resistance welding machines by controlling the contactor on the welder has been placed on the market by the General Electric Co., Schenectady, N. Y. The new timer, which is especially intended for spot and projection welding, eliminates human inaccuracy and guesswork, is easily and accurately set for the most suitable time, and once set, the time is unaffected by line-voltage variations or surges. After being adjusted for welding two thicknesses of metal, the control will provide satisfactory welds when several thicknesses of metal are placed between the electrodes, no change in timer or welder setting being required.

The new timer is furnished in several different forms. In addition to the timer unit alone, combinations of the timer with single- and double-pole large and small contactors are available.

Simplex Precision Boring Machines

Floor type precision boring machines recently built by the Stokerunit Corporation, 5325 W. Rogers St., Milwaukee, Wis., for the accurate boring of parts with tungsten-carbide or diamond tools are shown in the accompanying illustrations. The machine in Fig. 1 is arranged with two spindle heads on the bridge for the simultaneous machining of two holes in one part or one hole in two separate pieces of work.

As in the case of the bench type machine described in March, 1934, MACHINERY, page 433, the motor on the front feeds the work-table through a lead-screw after the work has been positioned close to the spindles by turning the handwheel. A second motor in the pedestal drives both spindles through V-belts. Both motors are started when the operator pushes a button, and when the boring is completed, a dog trips an electric switch, stopping both the feeding of the table and the rotation of the spindle.

To insure quiet operation, the machine proper is mounted on rubber pads inserted in the pedestal casting. Likewise, the motor in the base is mounted on rubber. All electrical equipment is accessible in the pedestal. The door at the front is equipped with a rack for holding spindle quills, tools, etc.

The machine illustrated in Fig. 2 is provided with a bridge at both ends to meet the condition where the center-to-center distance between holes to be bored in a gear-pump cover is too close to enable the use of two spindle heads on the same bridge. This pump cover and two different sizes of pump housings can be accommodated in the same fixture, although different tools must be provided. Three motors drive this machine, there being a separate motor for each spindle and a reversible motor for actuating the table.

The operating cycle of this machine consists of loading the fixture and advancing it to the cutting position relative to the left-hand spindle head by means of the handwheel. The advance of the table automatically selects the proper spindle motor and table feeding direction, so that when the operator next pushes a starting button and engages the feed-lever, the machine passes through a boring cycle and comes to a stop. As the table is then traversed toward the second head, the other spindle motor and opposite feeding direction are automatically selected, so that when a second push-button is pressed, the other hole in the work is bored by the equipment on the right-hand side of the machine.

The electrical equipment for this machine was developed in conjunction with the Cutler-Hammer Co. When the work-table is in the loading position at the center of the machine, the electrical equipment is disconnected to guard against accidental starting.

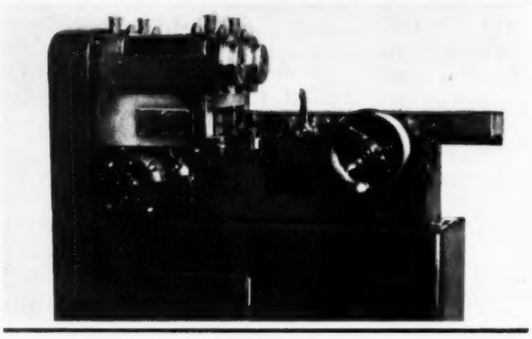


Fig. 1. Precision Boring Machine Built by the Stokerunit Corporation with Two Spindle Heads Mounted on One Bridge

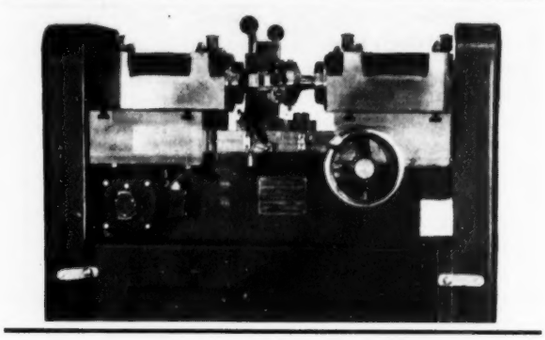


Fig. 2. Floor Type Precision Boring Machine with Spindle Heads Mounted at Opposite Ends of the Base

Leeds & Northrup Heat Control for Furnace Roofs

Furnace roofs can now be protected from overheating by a simple control device which gives three-fold protection against excessive roof temperatures. This is accomplished by a new temperature limit control developed by the Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

This control acts as follows: (1) It swings a big black arrow around a large white dial so that the roof temperature of the furnace can be seen at a glance from a considerable distance; (2) it records the roof temperature on a circular chart; and (3) it reduces the fuel automatically, if the roof is threatened by excessive temperature, and turns on the fuel again as soon as the roof is safe.

Through the use of such a control, the number of heats per roof is noticeably increased. The roof can be insulated safely, and the operator can run his furnace right up to its highest

safe temperature without fear that the roof will be damaged. The control has been designed particularly with a view to simplicity of use and operation, to withstand rough service, and to require a minimum of maintenance.

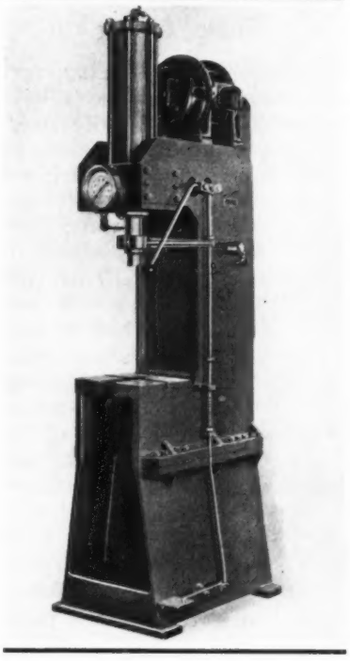
Logansport Hydraulic Forcing and Broaching Presses

A new line of all-steel, electrically welded, hydraulic forcing and broaching presses has recently been developed by the Logansport Machine Co., Logansport, Ind. This line of presses will be manufactured in sizes ranging from 1/2 ton to 50 tons capacity. The small presses up to 5 ton capacity can be furnished for bench mounting.

The oil reservoir for the hydraulic circuit is in the column of the press. The oil-pump, valves, etc., are mounted on a panel attached to the column and are within the oil reservoir. The pump is chain-driven by a motor mounted on top of the column.

The hydraulic control valve is operated either by foot or hand. Provision is made for automatic or manual reversal of the ram, which can be reversed at any point of the down stroke. When the ram reaches the top position the pump by-passes and does not work against pressure.

A stop-rod arranged on the side of the press has adjustable stops for regulating the length of down travel and the position of the ram at the end of the upward stroke. A coolant pump and pan can be provided when the press is to be used for broaching operations. Tables of various heights and designs can be furnished to suit special requirements and hydraulically operated or air-operated work-holding fixtures can be provided.



All-steel, Electrically Welded Hydraulic Forcing and Broaching Press

Steelweld Press Type Bending Brake

A vertical press type bending brake having box type steel welded housings with a throat depth of 18 inches has been placed on the market by the Steelweld Machinery Co., E. 70th and Machinery Ave., Cleveland, Ohio. The manufacturers claim that this bending brake will not fail in case of accidental overload, but will stall without damage to the machine. The deep throat enables the user to turn up large flanges for the entire die length. Work much longer than the normal capacity between housings can be handled.

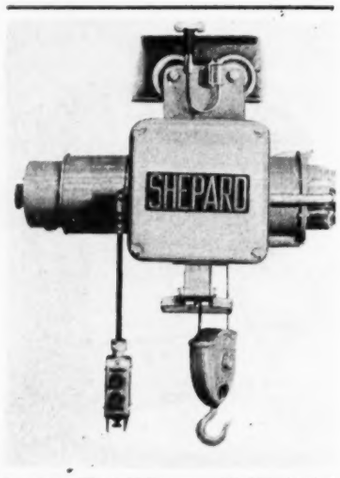
All sizes are driven by twin gears, and the eccentric shafts are forged solid, the eccentric being located directly above the ball joint. The ball joint is composed of a steel cylinder welded to the ram. The clutch and brake are both of the twin disk type, and are mounted on opposite sides of the housing to prevent overheating. The flywheel is drilled to provide air cooling for the clutch. On the 10-foot machine, the ram can be swiveled so that taper work up to 1/4 inch taper per foot can be handled. A micrometer dial gage is provided for indicating settings.

The tongue slot for the bed and ram is in alignment, parallel, and straight, within limits of 0.002 inch to the inch, in both the bed and ram. A removable clutch pedal is provided to eliminate danger in resetting the dies. This pedal can be quickly attached in any position at the front of the bed without the use of wrenches or other tools.

All-steel Bending Brake Built by Steelweld Machinery Co.

Rawlplug Expansion Bolts

An interesting development in holding or anchoring devices is a new expansion bolt called the Rawl-Drive, just placed on the market by the Rawlplug Co., Inc., 98 Lafayette St., New York City. This is a holding device similar to a bolt or rivet for holding or attaching objects to hard materials, such as concrete, brick, stone, etc. It looks like a bolt and can be driven in like a nail. Because of its expansion feature it provides a secure anchoring device. The simplicity and ease of using the new fastening device is its especial feature. A hole is drilled in the material, the part to be attached is put in place, and by a few sharp blows of a hammer the Rawl-Drive is anchored permanently.



Hoist Equipped with Shepard Push-button Control

Shepard Push-Button Control for Cranes and Hoists

A selective five-speed push-button control for cranes and hoists has been developed by the Shepard Niles Crane & Hoist Corporation, 444 Schuyler Ave., Montour Falls, N. Y. The five speeds are controlled by one button. The operator, increasing the pressure of his thumb, feels the change as each of the five independent speeds is obtained when the button is pressed or released. The first is a "creeping" speed. Each of the four succeeding speeds gives a gradual increase of torque. By releasing the button gradually, the motor is slowed down through the same graduated speeds to a stop.

All five speeds are usually obtainable for lowering, regardless of the load. In hoisting, the percentage of rated load being lifted determines the number of speeds available. Thus full loads will not move upward until the push-button is pressed to the third or fourth point.

When the movement of the crane bridge and the transverse motion of the trolley, or other movements, as well as the lift of the hoist, are to be controlled, individual push-button controllers are provided for each operation. These controllers are built in two sizes, rated at 3 and 7 1/2 horsepower.

Ingersoll Heavy-Duty Face Milling Cutter

A heavy-duty face milling cutter for use on cast iron and steel, known as the Type NB, has been added to the line of cutters made by the Ingersoll Milling Machine Co., Rockford, Ill. These cutters are intended for general milling cuts up to 3/4 inch deep. The body or housing is made from an alloy-steel forging, carburized and heat-treated, the blades being made from high-speed steel and serrated.

The blade is held in position by a hardened wedge, locked in place by a hollow-head cap-screw. Removals and adjustments can be made without damage to the housing, wedges, or screws. Two designs are available—one for spindle noses made to the National Standard for planer type milling machines, and one to the National Standard for knee type milling machines. The cutters are available in sizes from 8 to 16 inches in diameter.

In actual use, when one of these cutters was taking a cut 3/4 inch deep by 11 inches wide in S A E-1020 steel, with a feed of 4.32 inches per minute, there was no blade movement in the body, although at the time, 60 per cent of the blade length had been used. An additional 15 per cent of the blade is available for taking reasonably light cuts.

Ingersoll Heavy-duty Milling Cutter

Elwell-Parker Tiering Fork Truck

A gas-operated tiering fork truck developed by the Elwell-Parker Electric Co., Cleveland, Ohio, for a prominent food container manufacturer, which has been in successful operation for some time, is now being placed on the market. This tiering fork truck is used in the method of handling work or goods known as the Elwell-Parker Pallet System. With this system, flat wooden pallets are loaded with containers and transported, tiered, and taken down again for delivery by a fork truck without disturbing the pallet load and without any manual effort. In some cases, the load can be shipped from the factory to the customer

Tiering Truck Operated by Four-cylinder Engine

without being removed from the original pallet, the pallet being of light, inexpensive construction that can be discarded when the product reaches its destination.

The truck has a rated capacity of 4000 to 7000 pounds and a speed of six to twelve miles an hour. The power plant is a four-cylinder motor of standard make developing 33 horsepower when operating at normal speed. The lifting forks of the truck are detachable and have side adjustment for spread and length to suit the type of wood pallet used. The load is elevated by means of a cylinder which receives oil from a heavy-duty geared hydraulic pump that is driven directly from the truck motor. The lowering valve is manually controlled, and movement of the forks either up or down can be stopped instantly at any point. A separate hydraulic ram is employed to tilt the upright forward and backward when loading and unloading the truck.

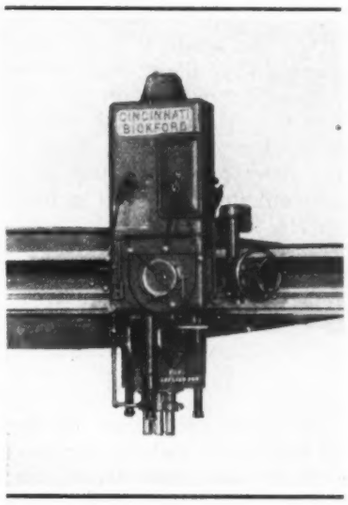


Fig. 1. Multiple-spindle Drill Head Applied to a Radial Drill

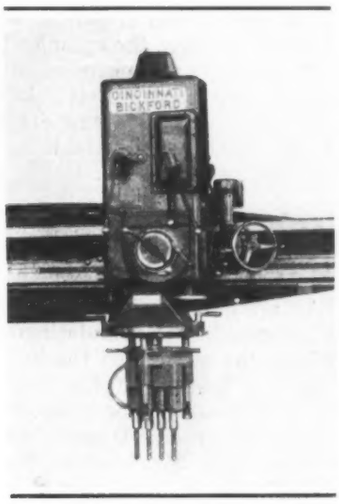
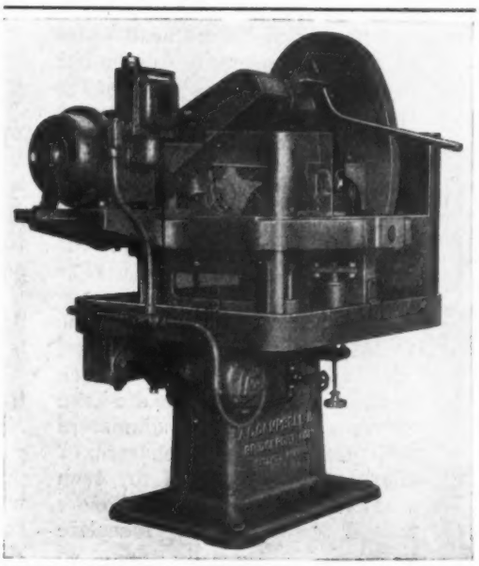


Fig. 2. Swivel Type Multiple-spindle Drill Head

Campbell Wet Abrasive Cutting Machine

The outstanding feature of an abrasive cutting machine developed by the Andrew C. Campbell Division of the American Chain Co., Inc., Bridgeport, Conn., is the method used for supplying the cutting disk with a liquid coolant. The disk, by its own speed, collects the proper amount of coolant and directs it into the cut. It is claimed that this arrangement supplies a continuous and uniform quantity of liquid which results in equal wear on both sides of the disk, eliminates burning or surface hardening, and improves the finish on the cut surfaces. Materials such as alloy steels, nonferrous alloys, plastics, and many other materials in solid bars up to 3 inches in diameter or tubing up to 3 1/2 inches in diameter, may be cut on this machine.

These machines are made in two models—the No. 202 on which the work clamp is operated by a foot-treadle, and the Model No. 203, which has an automatic, electrically operated clamp. Both models have pedestal bases, and all moving parts are protected, as may be seen in the illustration, and at the same time, are readily accessible.



Campbell Wet Abrasive Cutting Machine

Cincinnati Bickford Multiple-Spindle Drill Heads

Two types of multiple-spindle drill heads have been developed by the Cincinnati Bickford Tool Co., Oakley, Cincinnati, Ohio, for use on their "Super Service" radial drills. A patented self-counterbalancing mounting bracket provides a rigid support, compensates for the weight of the head, and permits quick return.

Fig. 1 shows the fixed-center type, ball-bearing drill head carrying three 1 1/4-inch drills spaced on 2 3/4-inch centers, each spindle having vertical adjustment.

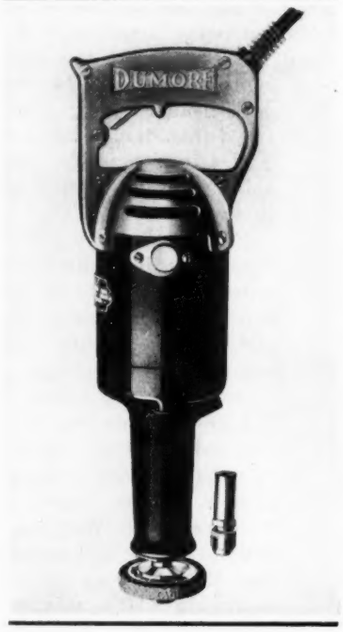
Fig. 2 shows a swivel type mounting which permits adjustment of the drill head through a complete circle. This ball-bearing drill head carries four 1-inch drills spaced on 3 1/16-inch centers. Cutting lubricant is supplied to each drill by separate nozzles. Both types of multiple heads illustrated and their patented mounting brackets can be removed in a few minutes, converting the machines into standard single-spindle radial drills.

The drill heads shown in the illustrations have the spindles in line, but other arrangements are equally applicable. Bolt circle drilling of several diameters is handled with an adjustable center distance drill head.

Dumore Hand Grinder

An air filter designed to keep all the grinding dust and dirt out of both the motor and the bearings is a feature of the No. 9 Dumore hand grinder recently announced by the Dumore Co., 25 Sixteenth St., Racine, Wis. The filter is enclosed in the end cap and can easily be removed, cleaned, and replaced. The grinder is built for the production grinding of large and small dies, molds for cleaning up weld spots, and similar work where power is required. Although the motor develops 1/5 horsepower, the tool weighs only 7 pounds.

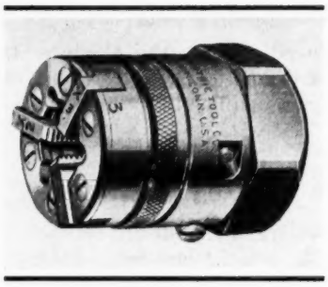
The ventilating fan is of the vacuum cleaner type, which prevents heating even when the tool is used on production work. The tool is equipped with three ball bearings and operates at a speed of 14,250 revolutions per minute. It can be supplied with either the spade type of handle shown in the illustration or with a handle mounted on the side. The tool is furnished complete with wheel and arbor, chuck for mounting wheels, small extension spindle, and two grinding wheels.



Dumore Hand Grinder Designed for Production Grinding

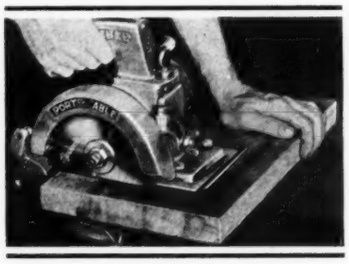
Geometric Small-Size Removable-Chaser Die-Head

A removable-chaser die-head for cutting threads of very small diameter and short length, such as are now being handled primarily with a solid tool, has been developed recently by the Geometric Tool Co., New Haven, Conn. This tool is known as the 1/4-inch Style EJ die-head. Complete with chasers, it weighs but three ounces, and is built to cut threads from No. 0 up to No. 14 machine-screw sizes in pitches of 20 or finer.



Geometric Die-head for Cutting Small Threads

The die-head employs a set of three removable, adjustable chasers which can be adjusted to cut any required decimal size. The chasers can be easily resharpened by touching up both the chamfer and the cutting face, after which they can be set back to the original size. One die-head covers a wide range of diameters and pitches, separate chasers, of course, being required for each diameter and pitch. The chasers extend beyond the faceplate which holds them in place, so that threads can be cut close to a shoulder.



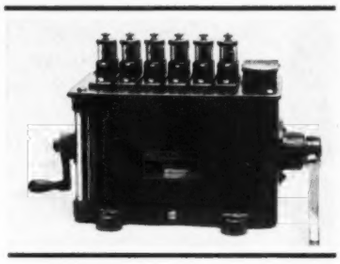
Porter-Cable Electric Saw with 6-inch Circular Blade

Porter-Cable Speedmatic Saw

A 6-inch circular-blade electric saw with a cutting capacity of 1 7/8 inches has recently been added to the line of portable tools made by the Porter-Cable Machine Co., Syracuse, N. Y. This tool is known as the Type K-66 Speedmatic saw. It has finger-tip depth and angle adjustment for raising and lowering the saw to the desired depth and for tilting it to a 45-degree angle. The blade is automatically guarded and can be changed without removing any part of the frame or guard. The special universal motor develops 1/2 horsepower at the idle speed of 5000 revolutions per minute. The cutting speed is 4000 revolutions per minute. Abrasive wheels for cutting stone, marble, slate, and composite materials may be used. The weight is only twelve pounds.

Hills-McCanna Force-Feed Lubricators

A Model ET enclosed type force-feed lubricator is being placed on the market by the Hills-McCanna Co., 2349 Nelson St., Chicago, Ill. This lubricator is made in two types. The Type SF, shown in the accompanying illustration, has a positive-drip sight feed built in on the discharge side of the pump. These pumps are intended for use where the oil feed is to be observed or checked at the pump. The Type BF is built without a sight feed. The latter pump is intended for use where the oil



Hills-McCanna Force-feed Lubricator

feed is to be checked in the delivery line or at the point requiring lubrication. The use of glycerin or blinker sight feeds is recommended in the oil line at such points.

The pump valves are of the single-plunger type. All working parts are under the cover of the cast-iron reservoir and operate in a bath of oil. Accurate regulation of the oil feed from one to ten drops at each stroke against pressures up to 2000 pounds can be obtained. The one-piece forged bronze pump valves that operate as independent pumping units can be removed individually. The pump valves are interchangeable. An auxiliary crank is provided for priming and flushing the oil lines. These lubricators are made in two-pint single-feed, four-pint one- to three-feed, and eight-pint one- to six-feed sizes.

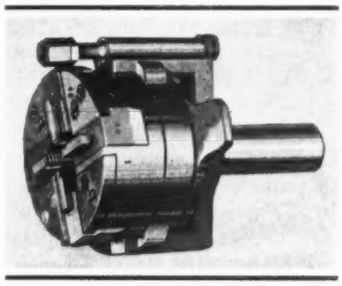
Detroit Portable Tensile Tester

A tensile tester of 4000 pounds capacity that weighs only 25 pounds is being introduced to the trade by the Detroit Testing Machine Co., 5137 Trumbull Ave., Detroit, Mich. This device is said to have the accuracy and other essential features of the larger laboratory machines, yet is light in weight and readily portable. The advantages of a machine of this type for field inspection work are obvious.

This tester is also recommended as an aid to salesmen and others for demonstration purposes, as it can readily be adapted to the testing of specimens of all kinds within its capacity. When used in the laboratory, it may be attached to a bench or table top. For use in the field, it is mounted in an attractive carrying case, approximately 5 by 7 by 15 inches in size.

Die-Head for No. 0 B & S Automatic

The Eastern Machine Screw Corporation, 21-41 Barclay St., New Haven, Conn., has announced the development of a new style of H & G die-head for the No. 0 Brown & Sharpe automatic. This die-head has inserted chasers, which are comparatively



Inserted-chaser Die-head for No. 0 B & S Automatic

inexpensive and are intended to be discarded when dull and be replaced with a new set. A new set of chasers can be substituted with practically no interruption of production and with very little adjustment.

The new head illustrated is known as the No. 101 size of Style DM. All parts of this die-head are hardened and ground. A further improvement of the "double arm drive" shank of this company's design, which takes the torque at a minimum distance from the center, is employed.

The die-head is equipped with both an adjustable pull-off trip and an adjustable head end-trip, the latter being advantageous for threading operations close to a shoulder. The die-head has a capacity for cutting threads up to 3/8 inch in diameter for a length of 3 3/8 inches, 9/16 inch in diameter for a length of 1 11/16 inches, and 3/4 inch in diameter for a length of 15/16 inch. The die-head is only 2 1/2 inches in diameter and uses the same chasers as the H & G inserted-chaser die-heads used on No. 2 B & S, 7/8-inch and 1 1/4-inch multiple-spindle machines.

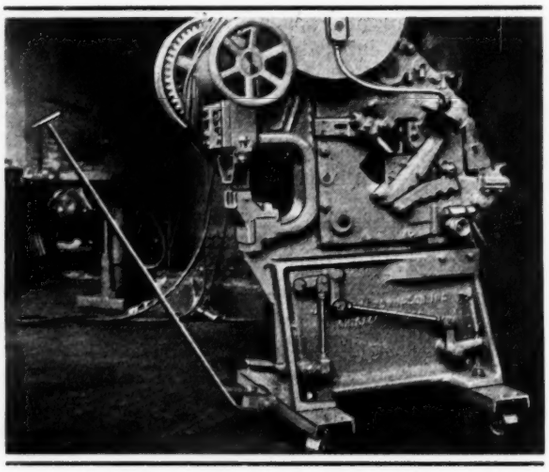
CP Super-Safety Balancer for Suspending Portable Tools

A counterpoise for suspending, balancing, and lifting portable tools has been developed recently by the Chicago Pneumatic Tool Co., 6 E. 44th St., New York City. A combination of a tapered drum, single cable, and a new method of applying the spring force is employed to give an exceptionally long travel. The stopping point is regulated by a mechanically operated Geneva gear, independently of the cable. Both hooks are of the closed throat or "safety" type, the top hook being arranged for lateral adjustment to assure proper centering of the cable and object suspended.

In the event of spring breakage, a safety latch immediately engages the teeth of the drum and prevents the load from dropping. The single cable construc-

Chicago Pneumatic Counterpoise Suspension for Portable Tools

tion permits the cable to be inspected or removed without disassembling or altering the spring adjustment. The cable is of the same quality as that used in airplane construction and has a safety factor of 10 to 1. The cable guide is faced with a removable and reversible soft steel block that can be easily reversed and replaced at low cost. A hardened worm provides means for adjusting the springs for different loads. This balancing device is made in seven sizes with weights of from 30 to 148 pounds and capacities from 30 to 200 pounds.



Ryerson Portable Combination Shear, Punch, and Coper

Portable Combination Shear, Punch and Coper

To enable their combination shear, punch, and coper to better meet requirements in certain fields, Joseph T. Ryerson & Son, Inc., Chicago, Ill., have developed the ball-bearing caster and steel channel mounting here illustrated. This mounting is so arranged that the machine can be easily pulled to any desired point in the shop. A 50-foot extension cable provides electrical connection for the motor. The handle used for pulling the machine is detachable and can be quickly connected at either end of the mounting.

The frame consists of a one-piece alloy steel casting with the various attachments built in at the proper working heights. The machine illustrated handles punching, plate, and die shearing, angle and tee cutting, angle mitering, coping, and notching, and can be furnished in various sizes and capacities.

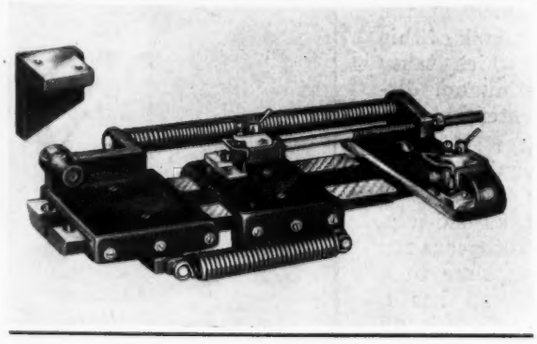
Four-Inch Dickerman Hitch Feed

A new and larger type of Dickerman hitch feed has recently been placed on the market by the Producto Machine Co., Bridgeport, Conn. This mechanism is designed to feed the stock automatically through the die of a punch press. The attachment is fitted to the die-holder and the operating cam is fitted to the punch-holder. On the upward stroke of the press, the springs are released, thus feeding the stock the required amount, which can be adjusted to suit requirements. The springs control the slide on which the gripper plate is mounted.

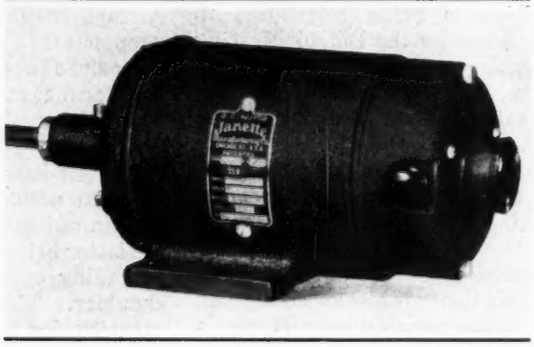
This feed will accommodate material up to 8 inches in width, and has a feed or travel up to 4 inches. It will feed the wider stock in thicknesses up to 1/16 inch and narrower stock in thicknesses up to 1/8 inch. As this hitch feed can be set up very quickly it can be used to good advantage for short as well as long runs.

Janette Motorized Speed Reducers

A line of "streamline" motorized speed reducers known as Type MSG has been brought out by the Janette Mfg. Co., 558 W. Monroe St., Chicago, Ill. These speed reducers are made in 1/50 and 1/20 horsepower sizes, with gear ratios ranging from 12.02 to 1 up to 66016.25 to 1. One frame size is used for all standard speeds from 286 to 0.19 revolution per minute. The different ratios referred to are obtained by taking out or putting in gears. These units are in-



Larger Type of Dickerman Hitch Feed for Power Presses, Recently Marketed



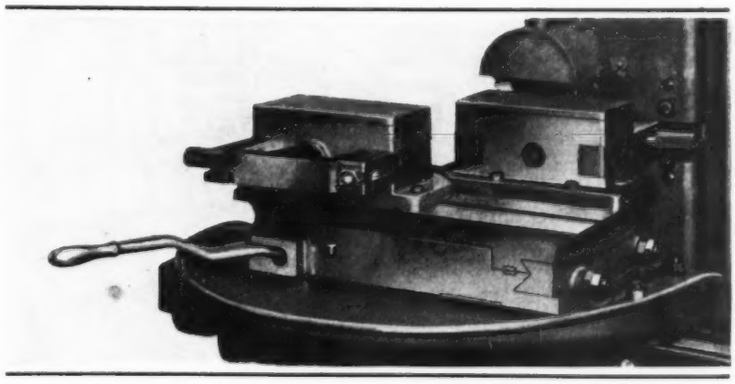
Janette Motorized Speed Reducer Made in 1/50 and 1/20 Horsepower Sizes

tended for operating valves, dampers, filters, automatic controls, small turntables, displays, and similar work requiring slow speeds.

Sundstrand Index-Bases for Milling Fixtures

A two-part base for milling fixtures, so arranged that the upper portion can be rotated and locked securely in two or more positions, has been brought out by the Sundstrand Machine Tool Co., Rockford, Ill. This index-base is made in several standard sizes for use on any make of miller or other machine tool. The illustration shows one of these bases with two fixtures mounted on it to provide for continuous milling, except for the few seconds needed for indexing. With this arrangement, the operator changes the work in one fixture while milling is in progress on the piece held in the other.

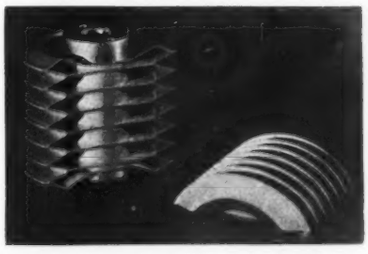
These index-bases are also made with the operating lever and clamping segment reversed, so that they can be used in pairs of "rights" and "lefts." The upper and lower members are securely clamped together or released by a simple movement of the single clamping lever. The smallest size index-base has a clamping surface 12 by 24 inches and weighs 325 pounds. The two larger sizes have tables 18 by 36 inches and 20 by 30 inches and weigh 625 and 700 pounds, respectively.



Sundstrand Index-base with Two Fixtures Arranged to Permit Loading One Fixture while Machining Work in the Other

Allis-Chalmers Reinforced Sheave

A reinforced steel sheave has been brought out by the Texrope Division of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., under the trade name "Duro-Brace Texsteel Sheave." This sheave has been designed to overcome the difficulty sometimes encountered of the outside walls bending under the strain of excessive overloads, with the result that they are "thrown off true." The outside walls of the new sheaves are reinforced by a convex steel plate which strengthens them to so great a degree as to practically eliminate distortion, irrespective of the strains imposed.



Allis-Chalmers Reinforced Steel Sheave

Welding at the rim and web, for additional strength, and an interior grid type construction developed especially to give greater rigidity are features of the former design that are retained in the new sheave.

Barrett Lift Truck for Tin Plate Skids

Barrett Lift Truck for Handling Tin Plate

A lift truck designed specifically for handling the new low 4-inch skids on which tin plate is being shipped has been brought out by the Barrett-Cravens Co., 3255 W. 30th St., Chicago, Ill. The truck has single lift, compound lift, and angle lift. When in the lowered position, it is only 3 1/2 inches high. It is 15 inches wide, and has a carrying frame 24 inches long with a clearance of 5 inches between the forks. Loads of tin plate up to 3500 pounds in weight can be raised a distance of 2 1/4 inches from the floor. Ball bearings are used throughout.

A new type of hand or electrically operated portable elevator designed especially for barrel handling has also been brought out by this company. The new elevator has a platform 30 inches wide, 30 inches long, and only 1 1/2 inches off the floor. A removable steel incline facilitates loading barrels on the platform. The lifting capacity is 500 or 750 pounds. The overall and lifting heights are made to suit.

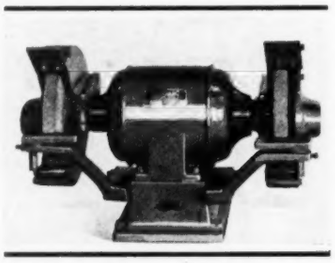


Fig. 1. Standard Electrical Tool Co.'s Special Bench Grinder

Standard Electrical Bench and Tool Grinders

The Standard Electrical Tool Co., 1938-48 W. Eighth St., Cincinnati, Ohio, has placed on the market a special bench grinder, as illustrated in Fig. 1. This grinder is equipped with 10-inch diameter wheels having 1-inch faces. The new machine is not intended for continuous operation, but rather to supplement the heavy-duty grinders made by this company. A buffing extension can be furnished in place of the wheel on the right-hand side of the grinder, if desired.

The surface and tool grinder shown in Fig. 2 is another recent product of the Standard Electrical Tool Co. This grinder is furnished in 1 and 2 horsepower sizes equipped with 10-inch by 1-inch and 12-inch by 1 1/2-inch grinding wheels, respectively. The table measures 11 inches by 21 inches. Five turns of the handwheel serve to adjust the table 1 inch. The handwheel spindle is fitted with an adjustable dial graduated in thousandths of an inch. The maximum distance from the wheel to the table is 12 inches. The base measures 20 by 28 inches. The illustration shows the machine fitted with a twist-drill grinding attachment. The net weight of the machine is 549 pounds.

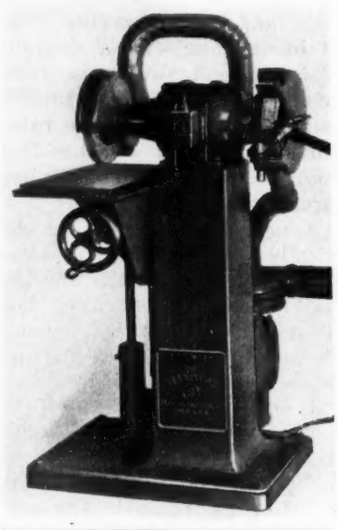
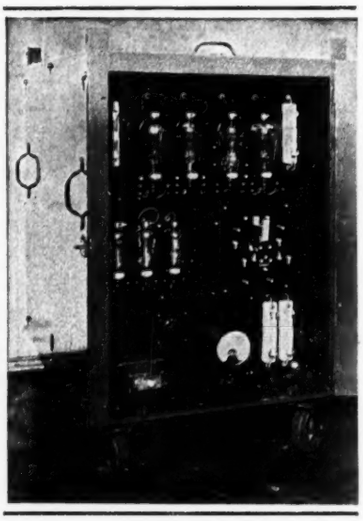


Fig. 2. Surface and Tool Grinder



Westinghouse Timer for Resistance Welding Machines

Westinghouse Ignitron Welding Timer

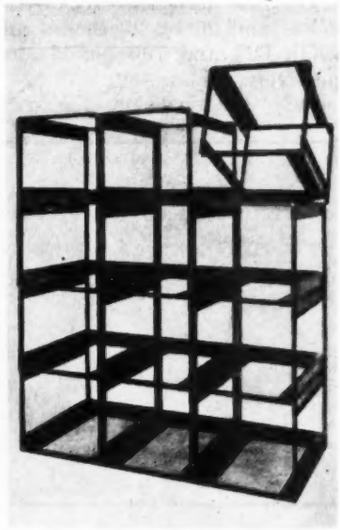
A portable Ignitron welding timer for the accurate timing of all types of resistance welding machines has just been announced by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This device has been so designed for accurate timing that it will pass electrical current for periods as short as one cycle or 1/60 second and is adjustable up to 30 cycles or 1/2 second. Such accurate timing has been found important in the fabrication of aluminum, aluminum alloys, and high-strength steels.

Besides its electrical advantages, this timer is comparatively light in weight and of compact design, making it more easily portable. It is only 46 inches high, 42 inches long, and 29 inches wide, and weighs about 700 pounds. A unit of this size will carry electrical energy in magnitudes as high as 700 kilovolt-amperes, 440 volts, single phase.

Stackbin Racks for Stacking Boxes

The stacking of cardboard, fiber, wood, or steel boxes of any size in such a manner that the bottom box is always as accessible as the top one is made possible by the "Stackrack" developed by the Stackbin Corporation, Providence, R. I. The Stackrack is a single unit made of channel and angle steel construction, solidly welded. A lip running the entire width of the rack at the back and a close fitting channel at the front completes the simple locking arrangement.

The size of the channels and angles employed in the construction is governed by the weight of the material in the boxes. This rack can be used under benches, in back of machines, and in auxiliary stock-rooms. The finish is olive green, baked-on enamel.



Stackrack for Stacking Boxes